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Headquarters
Department of the Army
Washington, DC

BRIGADE ENGINEER COMBAT OPERATIONS (ARMORED) (DIGITAL - COORDINATING DRAFT)

1. Change FM 5-71-3, 3 October 1995, as follows:

Remove Old Pages	Insert New Pages
i through vii	i through vii
1-1 through 1-10	1-1 through 1-12
2-1 through 2-14	2-1, 2-1a through 2-1d, 2-2 through 2-6b, 2-7 through 2-16
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2. A bar (|) marks new or changed material.

3. File this transmittal sheet in front of the publication.

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Brigade Engineer Combat Operations (Armored) (Digital - Coordinating Draft)

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CHAPTER 1

Engineer Operations and the Brigade Battle Space

FXXI armored brigades are organized to fight successful engagements in conventional war and various contingency operations. Brigades are subordinate commands of a division and corps and perform major tactical operations as part of a division or corps operation. Regardless of the threat environment, the key to victory is to impose our will on the enemy by forcing him to conform to the brigade's desired end state. This requires the brigade commander and staff to identify the decisive point(s) and synchronize the efforts of the subordinate maneuver battalions, combat support (CS), combat service support (CSS), and available higher HQ combat power in support of the brigade effort.

The FXXI communications and information sharing technologies found within the FXXI brigade are used to enhance the brigade's situational awareness (SA) of the enemy, friendly forces, and the terrain. This technology is but one factor in increasing the combat potential of the FXXI brigade as a tactical organization. The advanced capability in digital information sharing will create conditions to improve the war fighting capability of the FXXI brigade. These advanced capabilities change the tactical employment of the brigade. As an example, an analog brigade must conduct movement to gain contact with the enemy. The FXXI brigade, with the division, will use its acquisition and reporting systems to place long-range effective fires on the attacking force. This will cause the enemy to react much earlier than intended, thus disrupting its plans and rhythm.

The automated systems of the FXXI brigade, operating through the tactical Internet (TI), provide horizontal and vertical digital integration for sharing information at brigade level and below. They also facilitate rapid, continuous operations at a high tempo. However, the FXXI brigade is more than a technologically advanced organization. The enhancements made to the TTP, the organization design, and innovative training methods are equally important to the collective effectiveness of the FXXI brigade as the technological systems it possesses.

As the building block of modular combat power, the FXXI brigade conducts operations that entail the application of combat power from mobile weapon and support system platforms in a way that destroys the enemy's will to fight. Embedded in the FXXI systems is the capability to plan and rehearse on the move and to more rapidly mass effects anywhere on the battle space. For example, with the addition of the Force XXI battle command brigade and below (FBCB2) and other FXXI systems (see *Appendix E)*, the FXXI brigade can conduct rapid day and night operations at a high tempo. Tactical operations in a digitized environment rely on mechanization and technology to maximize mobility, firepower, protection, and control. FXXI mounted forces are characterized by their ability to project, deliver, and sustain combat power in a rapid, highly lethal, and survivable manner. These forces conduct reconnaissance while mounted and dismounted, and can close with and defeat enemy forces.

The FBCB2 provides the system user with enhanced SA and the ability to conduct parallel planning. FBCB2 also supports the military decision-making process by allowing the commander to quickly communicate to staff and subordinate commanders his vision and intent. The anticipated exponential increase in SA (such as the ability to see the terrain, enemy, and friendly dispositions) is brought about by an

increased flow of automated combat information passed through the TI. Therefore, both commanders and staffs will be able to make more informed decisions faster. Given this capability, tactical units may organize and employ themselves differently to optimize this advantage over potential adversaries.

FXXI Battlefield Operating Systems (BOS) capabilities have been proven and, as stand-alone systems, they provide SA and combat information that can be manually shared and used to support battle planning and war-gaming efforts. While these FXXI systems mature in allowing vertical and horizontal communication through the TI, commanders at all levels should strive to fully integrate these systems into the war-gaming, battle planning, command and control (C^2), and execution processes.

NOTE: Digitization improves lethality and the ability to increase the tempo of tactical operations. However, the desired interconnectivity and consistent interoperability between FXXI systems has yet to be fully demonstrated in a field environment.

The FXXI engineer battalion focuses on maneuver at the tactical level. To accomplish this task during operations, the battalions will have the following Army Battle Command Systems (ABCSs) (see *Appendixes C and E*):

- Maneuver Control System (MCS).
- All-Source Analysis System—Remote Workstation (ASAS-RWS).
- Maneuver Control System-Engineer (MCS-ENG).
- FBCB2.
- Combat Service Support Control System (CSSCS).

The MCS-ENG will provide the engineer battalion interoperability and access to information from the maneuver brigade's ABCS components. They are the—

- Maneuver Control System.
- All-Source Analysis System—Remote Workstation.
- Combat Service Support Control System (CSSCS).
- Digital Topographic Support System (DTSS).

The engineer battalion conducts mobility, limited countermobility and survivability, and limited general engineering missions to support maneuver in the brigade area.

The FXXI brigade may be task-organized with analog units and/or organized with—

- A combination of FXXI armored and mechanized infantry battalions.
- A FXXI brigade reconnaissance troop (BRT).
- A FXXI aviation battalion or task force (TF).
- A FXXI light infantry battalion.
- Task-organized CS and reorganized CSS units possessing FXXI systems.
- Echelon above division (EAD) EN units.

NOTE: The FXXI brigade can be task-organized with analog maneuver, CS, and CSS units. In this case, the FXXI brigade commander and staff must develop techniques and procedures that integrate and synchronize these assets into a cohesive fighting force.

The FXXI DIVEN battalion is structured to provide support to three mechanized or armored TFs (FXXI or analog); it is not structured to provide continuous, dedicated support to the other units (see *Appendix A*).

However, engineer support to the other units is still the brigade engineer's responsibility. He employs nonorganic and/or corps engineer assets to meet this responsibility. Corps-level support normally consists of a company from a corps combat battalion (mechanized), a platoon from a combat support equipment (CSE) company, or a horizontal construction platoon from a combat-heavy company provided in direct support (DS) for specified times or tasks. This level of support may be increased based on the mission, enemy, terrain, troops, and time available

(METT-T) and the brigade's priority within the division scheme of maneuver (see *Appendix A*).

NOTE: The brigade engineer must develop TTP that will address communications requirements between FXXI and analog engineer assets and the means by which that communication will be effected.

MISSION

The primary mission of the brigade is to deploy on short notice and destroy, capture, or repel enemy forces, using maneuver and shock effect. The FXXI brigade will perform the operations and missions outlined in *Table 1-1*.

Table 1-1. FXXI brigade missions

Information Operations	Decisive Operations	Security Operation
Screen	Attack	Cover
Movement to contact	Defend	Delay
Demonstration		Relief
Feint		OOTW
Raid		Postconflict operations

The engineer battalion conducts engineer battle space functions for the brigade, focusing on mobility, countermobility, and survivability (M/CM/S) tasks. It focuses its effort on the brigade's deep, close, and rear operations. As a combat multiplier, the engineer concentrates his efforts on maintaining the brigade's freedom of movement and lessening the enemy's ability to mass and maneuver on the battle space. In the FXXI structure, the engineer can accomplish this mission using the information sharing capabilities of the MCS-ENG and FBCB2 systems. The commander can now see where obstacles are located and mass his forces, as required, to reduce or destroy the obstacle.

ENGINEER BATTALION ORGANIZATION

The FXXI mechanized engineer battalion has three combat engineer companies and a headquarters and headquarters company (HHC). The battalion is organic to infantry/armor maneuver brigades. It may be tasked-organized with specialized engineer organizations in command or support relationships to provide a tailored package for a particular mission. Its HQ provides centralized C^2 for the total engineer battalion effort. The battalion engineer commander (brigade engineer) task-organizes engineer units and corps assets to the forward FXXI combat engineer battalions. This task organization is what creates the engineer force. The engineer battalion trains and operates with its maneuver brigade.

The engineer battalion organization is tailored to support the brigade/TF commander's intent and scheme of maneuver. In *Figure 1-1, page 1-4*, a reinforced engineer battalion supports its maneuver brigade, which is the main-effort brigade. Two of its companies support the lead TFs, while the third organic company controlling the battalion's three obstacle sections is in a follow-and-support role. The battalion is augmented with an engineer company in DS from the engineer battalion organic to the follow-on brigade. It accepts obstacle handover from the lead TFs and improves the lanes. Generally, the engineer battalion organization can control two to five companies.

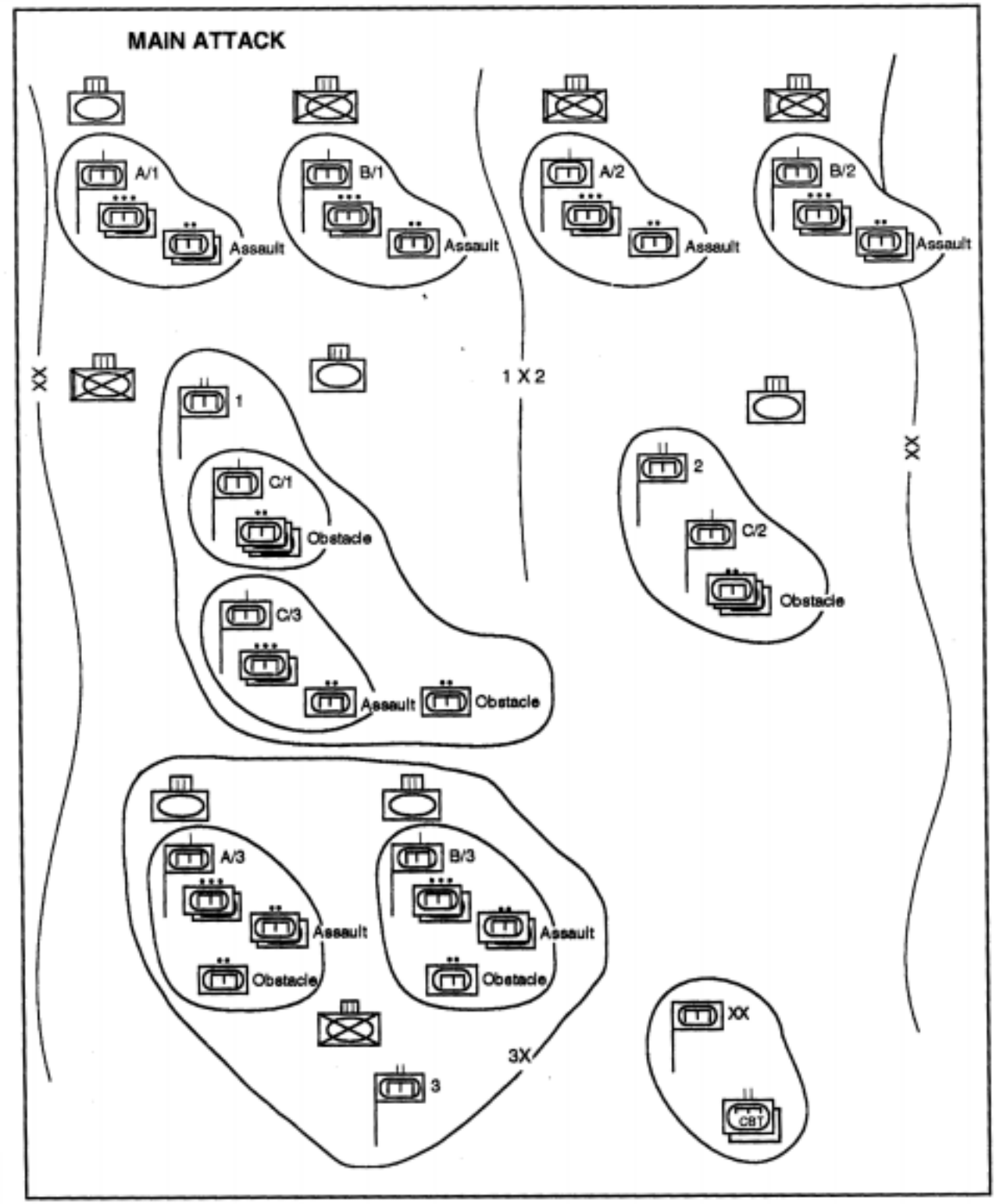

Figure 1-1. Brigade engineer organization offensive scenario

EMPLOYMENT PRINCIPLES AND CONSIDERATIONS

The FXXI battalion engineers are organic to the maneuver brigades. Through the tactical decision-making process the brigade engineer properly task-organizes his combat engineer companies to accomplish the engineer mission. Task organization and command/support relationships are METT-T driven. The following organizational principles provide a framework for commanders and staff officers:

- Task-organizing engineer forces to the requirements.
- Giving priority to the main effort.
- Integrating engineers with maneuver and fire.
- Ensuring that current engineer operations promote future maneuver combat operations.
- Avoiding holding engineers in reserve (engineer forces can be positioned to support the reserve or counterattack [CATK] force or positioned in a follow-and-support role).
- Building a logistically sustainable force.
- Maintaining effective C^2.
- Using all local resources.

Figure 1-2, page 1-6, shows the layout of the command/support relationships as it applies to task-organizing engineer assets to support the engineer battalion operations; however, these are general guidelines. The battalion commander weighs the alternative between command or support relationships based on the concept of the operation and the capabilities of the supported force. The main considerations are to—

- Mass to support the main effort.
- Preserve vertical and horizontal integration of C^2 to ensure maximum effectiveness.
- Maintain flexibility to rapidly shift and synchronize engineer operations.
- Assess the ability of the supported force to logistically support the engineer force.

BATTLEFIELD OPERATING SYSTEM INTEGRATION

The brigade engineer must understand the capabilities of other combat, CS, and CSS elements to properly integrate his BOS. He must also understand every BOS to integrate and synchronize engineer operations on the battle space.

INTELLIGENCE

The intelligence preparation of the battlefield (IPB) is a staff tool that helps identify and answer the commander's priority intelligence requirements (PIR). The battalion Intelligence Officer (US Army) (S2) initiates and coordinates the IPB and uses it to predict battle space events and synchronize courses of action (COAs). The engineers use the MCS-ENG and terrain visualization products from the DTSS and terrain team to analyze the entire division area, but focus in more detail on the area of operations (AO). In addition to current enemy information, both textual and imagery data is top fed to the ASAS-RWS and DTSS databases to assist in the threat and terrain analysis. The IPB process is a continuous and systematic four-step procedure performed for a specific geographic region. The steps are—

- Define the battle space environment.
- Describe the battle space effects.
- Evaluate the threat.
- Determine the threat's COAs.

As the commander's PIR are answered, the analysis is updated and reviewed.

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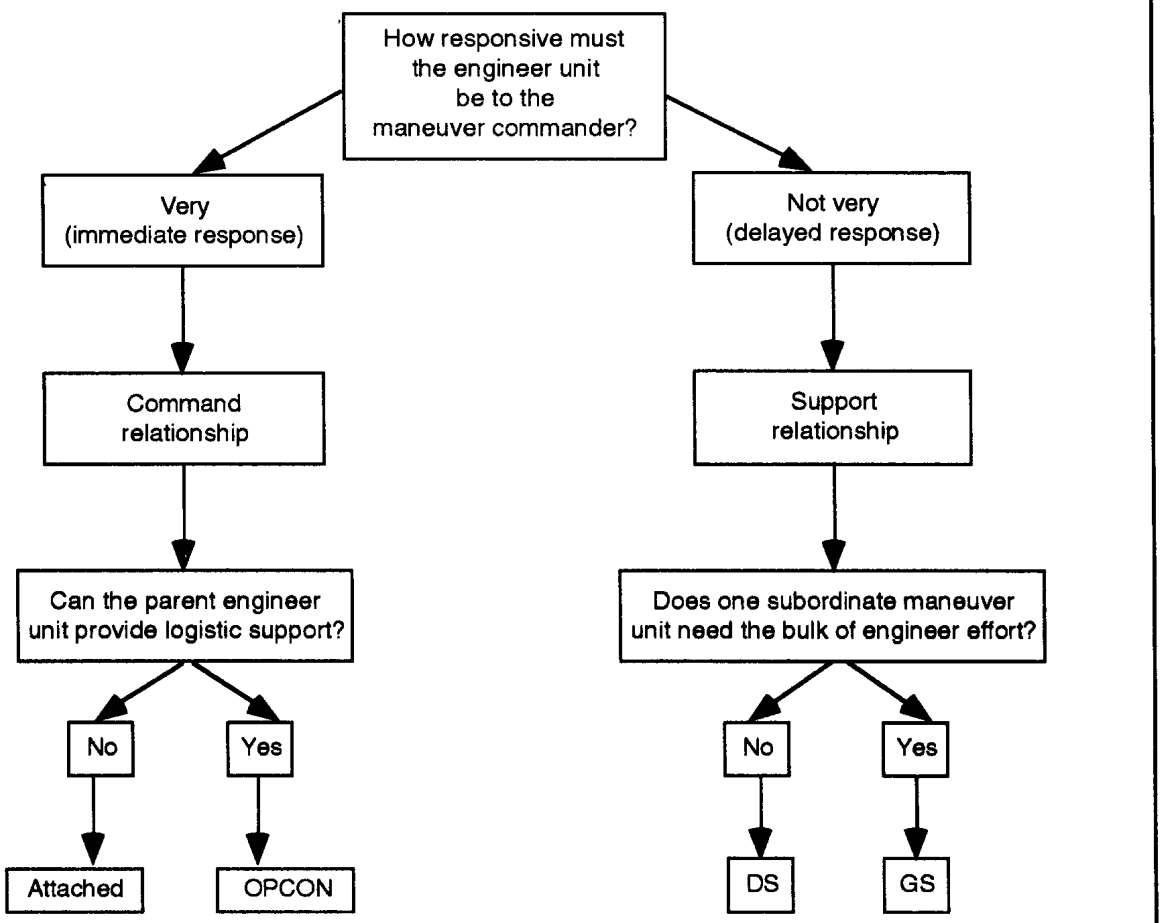

Engineer Support

	Command/ task-organize	Assign tasks	Support logistically[2]	Reorganize as infantry
Attached	S	S	S	S
OPCON	S	S	P	S
Direct[1] support	P	S	P	P
General support	P	P	P	P

Notes: [1]The engineer commander retains the authority to further allocate engineer support in a DS relationship to maneuver.

[2]Although this is the normal arrangement, support can be obtained from the supported unit with prior coordination.

Legend: P = Parent unit

S = Support unit

Figure 1-2. Command/support relationships

The engineer staff uses the engineer battlefield analysis (EBA) as a tool to integrate his BOS into the IPB process. The EBA process is greatly enhanced by the addition of the DTSS, MCS-ENG, FBCB2, and the ASAS-RWS systems. The EBA focuses on analyzing the following elements and predicting the overall effect on the operation:

- Terrain analysis.
- Enemy mission and mobility and survivability (M/S) capabilities.
- Friendly mission and M/S capabilities.

The IPB and EBA are conducted concurrently, resulting in intelligence products that are digitally distributed to the TFs. The coordination between the brigade S2, the engineer battalion Operations and Training Officer (US Army) (S3), the assistant brigade engineer (ABE), and the engineer battalion S2, and the noncommissioned officer (NCO) allows BOS integration to occur. The IPB and EBA processes are discussed in more detail in *Chapter 2*.

NOTE: The resident ABCS tools will greatly ease the production and dissemination requirements during the IPB/ EBA procedures. As the staff updates the commander's critical information requirements (CCIR), the systems will update the analysis to provide continued current updates.

MANEUVER

Maneuver refers to the employment of forces through offensive or defensive operations to achieve a positional advantage over an enemy force. As the commander develops his concept of the operation and goes through the war-gaming process, he is careful to retain a balance in the application of maneuver, firepower, and force protection. The nature of this balance establishes the priorities and relationships of maneuver to other combat functions.

Engineer forces conduct mobility and shaping operations by emplacing obstacles (such as the Volcano) and building fortifications to enhance the brigade's ability to maneuver and fight on the battle space. In the offense, the engineer assesses force ratios to determine the type of breaching operation required. Moreover, with the brigade staff, the engineer war-games the breaching operation to synchronize maneuver and fire power. In the defense, he ensures that tactical and situational obstacles are integrated with direct and/or indirect fires to support the scheme of maneuver.

NOTE: With the Army Tactical Command and Control Systems (ATCCSs) as the transportation media for ABCS, the engineer commander has near real-time SA of both enemy and friendly forces. This SA enhances the commander's and his staff's ability to anticipate what actions to take and when to take them. Obstacles emplaced by the engineer platoons are placed (icons) on the MCS-ENG via FBCB2. The icons are vertically and horizontally disseminated to all elements of the brigade and division. These obstacles are then placed into the Advanced Field-Artillery Tactical-Data System (AFATDS) at division and incorporated into the overall fire-support plan. The Raptor ICO (see *Appendix C),* when fielded, should be capable of providing near real-time targeting information to AFATDS to adjust fires within the range of indirect-fire systems.

When employed as a separate engineer TF for combat operations or operations other than war (OOTW), the engineer battalion may have maneuver forces, military police (MP), and smoke assets task-organized to it. Consequently, the engineer battalion commander must fully understand the capability and limitations of each of these assets.

MOBILITY AND SURVIVABILITY

Combat engineer operations are integrated to ensure that the brigade masses its combat power at the right place and time. The breaching tenets (intelligence, fundamentals, organization, mass, and synchronization)

and obstacle integration are two examples of engineer planning and operations requiring close coordination to achieve mass. During the planning, preparation, and execution phases, the brigade engineer and his staff work closely with other brigade staff officers' war gaming, integrating, and synchronizing engineer operations.

Artillery-delivered scatterable mines (SCATMINEs)/Hornet product-improvement program (PIP) are always considered in offensive and defensive operations. The brigade engineer plans all SCATMINE systems. The scheme of employment involves getting the right obstacle effect to the right target at the right time. The commander, S2, S3, engineer, and FSO develop the scheme of employment. Proper obstacle employment occurs by war gaming the COAs and identifying battlespace conditions that trigger target execution.

Nuclear, biological, and chemical (NBC) defensive measures fall under the M/S BOS and must always be integrated and predicted as a critical element of survivability operations.

NOTE: The use of the ABCS in the brigade command post (CP) enables the staff to accomplish the above tenets with greater accuracy and speed. Near real-time SA allows mass to be achieved with greater speed and accuracy. The obstacle plan, breaching lanes, chemical information, and current terrain information is displayed for all leaders as a common picture. This SA gives the brigade an incalculable advantage in combat.

FIRE SUPPORT (FS)

FS coordination is critical to engineer operations. The brigade fire-support coordinator (FSCOORD), fire-support officer (FSO), and engineers coordinate the effects of FS in offensive and defensive operations. In the FXXI brigade, this is accomplished by the engineer placing his obstacle information on the MCS-ENG and sending it to the FS AFATDS. This provides for accurate and current information to develop the FS plan for the brigade. To support combined arms breaching in the offense, fires are planned to suppress and obscure the enemy. Critical friendly zones (CFZs) are planned at the breach site to support counterfire operations. In the defense, fires are planned to maximize the effects of both tactical and situational obstacles. Considerations for planning where fires can be placed include:

- Forward of the obstacle to disrupt enemy formations and force the enemy to deploy into forward engagement areas (EAs).
- Sides of the obstacle to hinder the enemy's attempts to bypass it.
- Behind the obstacle to destroy the enemy piecemeal as it passes through the obstacle.

A plan should be developed that provides for continuous observation from multiple vantage points.

NOTE: With the new generation of battle space sensors, the capability of the engineers to help shape the battle space and tie in sensors direct to the shooter makes the FSO/engineer an even more lethal link. As part of the FXXI reconnaissance systems, Raptor ICO and unmanned aerial vehicles (UAVs), provide an enhanced flexibility in obstacle observation for integration of fires.

AIR DEFENSE

Air-defense artillery (ADA) is planned and coordinated to protect friendly units from enemy air attacks. The brigade engineer integrates AD protection for the following:

- Combined arms breaching.
- Combined arms obstacle operations.
- Survivability operations.
- Class IV/V supply points and mine dumps.

The brigade engineer coordinates ADA coverage of breach points, C^2 nodes, bridge crossings, key supply points, and critical

movement routes. He ensures that his subordinates are aware of the threat and trained on reaction to enemy air attacks.

COMBAT SERVICE SUPPORT

Sustainment is the preparation and the continuous execution of CSS functions in support of the commander's tactical plan. Sustaining the engineer force includes manning, arming, fueling, fixing, moving, and sustaining engineer assets on the battle space. A major element in the CSS to the brigade and its plan is the engineer battalion's ability to maintain supply flow based on mobility and countermobility (M/CM) mission requirements. CSS operations are discussed in *Chapter 6*.

C^2/BATTLE COMMAND

Leadership is still the critical element to successful combat operations, but almost as critical is the ability to manage information. In FXXI units, the commander and staffs can be overcome by the amount of information they now have access to. The ability to manage and get information to the commander has become a key element in battle command and C^2. With emerging technological advances in information processing and management, Army operations are profoundly affected by how well this information is electronically shared. Battle command relies increasingly on the ability to process relevant information and move it rapidly to critical points in the operational area.

The FXXI brigade exploits its automated command, control, and communications (C^3) system to maintain an increased level of SA to make more informed decisions regarding tactical employment. Automated information functions enhance staff integration and the synchronization of combat multipliers with maneuver forces during combined arms operations. These C^3 enhancements also permit the establishment of a variety of digital interfaces with various higher HQ (such as the parent division, other brigades, corps HQ, joint brigade HQ). The commander of a FXXI brigade must provide clear guidance and direction to his staff and subordinate commanders in regard to information operations (IO) in order to retain an information advantage. See *Chapter 2 and FM 100-6, Chapter 6* for a detailed discussion of C^2.

The commander and his staff plan, coordinate, synchronize, and monitor engineer operations from C^2 facilities containing more than one echelon. Staff participation varies at each echelon. The facilities include a—

- Tactical CP.
- Main CP.
- Rear CP.

The brigade engineer focuses on integrating C^2 of all engineer functions into the brigade C^2 process for deep, close, and rear operations. See *Figure 1-3, page 1-10*, for the C^2 laydown and *Figure 1-4, page 1-10*, for the flow of reporting.

The FXXI facilities include a—

- Tactical CP.
- Main CP.
- Battalion administrative logistic operations center (ALOC).

For more information on these facilities, see *Appendix B*.

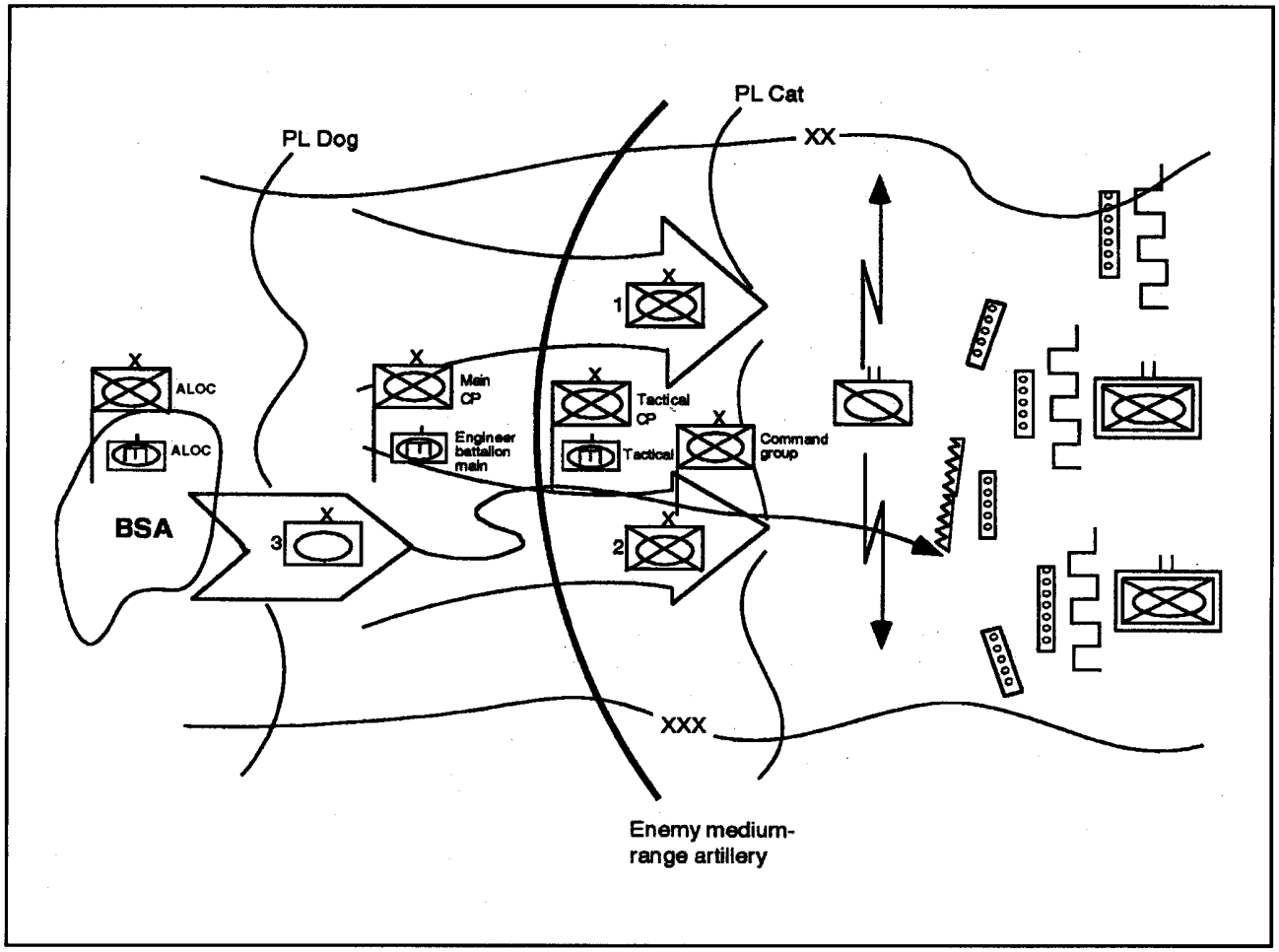

Figure 1-3. C^2 laydown

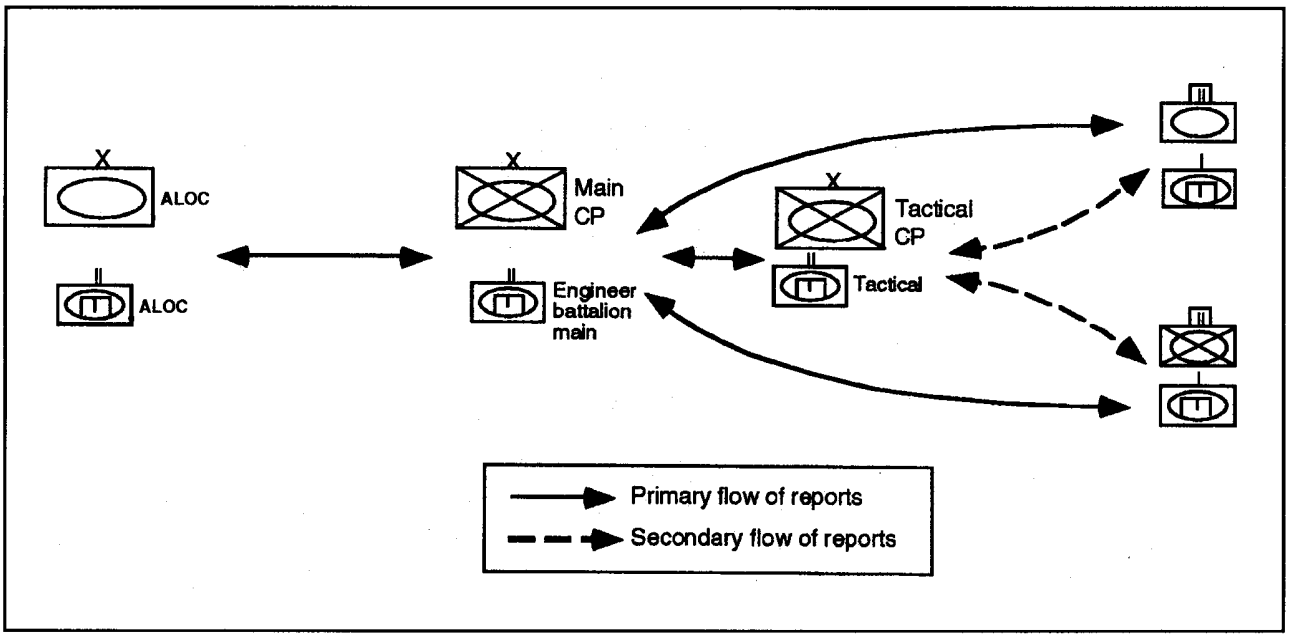

Figure 1-4. Report flow

CHAPTER 2

Command and Control

C^2 is the process through which the activities of the engineer battalion are planned, coordinated, directed, and controlled to accomplish the mission. The process encompasses the personnel, equipment, communications, facilities, and procedures necessary to gather and analyze information to plan, issue instructions, and supervise the execution of operations.

Each engineer C^2 facility must have a definable purpose that is clearly understood. Leaders provide the purpose and motivation that form a versatile C^2 system. The primary objective of each facility is to support the battalion commander. Effective engineer C^2 enables the commander to integrate engineer operations and support the brigade's scheme of maneuver.

FXXI C^2 MANAGEMENT PROCESS

The MCS, MCS-ENG, ASAS, and FBCB2 located at the engineer battalion main CP are the ATCCS that speed information sharing, planning, and the decision-making process. Digital information is transmitted and received between the engineer battalion, subordinate engineer units, and the supported maneuver battalion through the TI using the engineer battalion's MCS to the supported maneuver brigade's—

- MCS.
- ASAS-RWS.
- CSSCS.
- AFATDS.
- Air-missile defense workstation (AMDWS).

See *Appendix E* for a discussion of the FXXI digital systems.

Digital systems complexity and the large amounts of information that can be passed via digital systems requires the development of an ATCCS management structure. This management structure is intended to satisfy both technical and tactical requirements. The personnel that compose the structure are the battalion executive officer (XO), the S3, the Signal Officer (US Army) (S6) (formally the battalion SIGO), the present BOS supervisors, system operators, and the staff elements.

The amount of information that is available to the commander and his staff in the FXXI CP has become so large that techniques and procedures must be developed for its management. An information manager must be appointed within the CP who can screen all incoming data and send forward, to the commander, only that information which he can use to make those decisions that he is required to make. The information manager must have the experience level necessary to determine what information is key and what is just "good to know" information. He will assist the commander in determining what information is needed to make those critical decisions. Based on the experience requirements and the need for an understanding of the ATCCS, it is recommended that the battalion XO become the information manager.

NOTE: Some ATCCS components will not digitally interface with others. Techniques and procedures must be developed to conduct workarounds. As software improvements are developed, this process will become seamless.

C^2 DEFINITION

C^2 is not one word as commonly perceived and used but two dependent concepts with distinct meanings. *Command* is the art of assigning missions, prioritizing resources, guiding and directing subordinates, and

focusing the entire engineer battalion's energy to accomplish clear objectives. *Control* is the science of defining limits, computing requirements, allocating resources, prescribing requirements for reports, monitoring performance, identifying and correcting deviations from guidance, and directing subordinate actions to accomplish the engineer battalion commander's intent.

C^2 PROCESS

The C^2 process is comprised of—

- Coordinating.
- Planning.
- Directing.
- Controlling.

The C^2 process is executed through—

- Leadership.
- C^2 facilities and nodes.
- Planning process.
- Communications (signals, written, digital, and verbal).

Command includes the responsibility of leading soldiers and units to successfully accomplish the assigned mission. An inherent responsibility of command is the safeguarding of soldiers entrusted to a commander.

To control is to define limits. Control within the FXXI engineer battalion is the science of using digitized systems to compute requirements, allocate means, and synchronize and integrate combined arms efforts. Establishing sound digital techniques and procedures and digitized SOPs will assist the commander in monitoring the status of organizational effectiveness as well as identifying any variance from standards and guidance set. The controls that the commander sets provide the means to accomplish his intent and develop specific instructions.

Control serves its purpose if it—

- Allows the commander freedom to operate.
- Delegates authority.
- Enables commanders to lead from any critical point on the battle space.
- Synchronizes engineer battalion operations across the AO.

The FXXI C^2 system supports the ability of the commander and his staff to adjust plans for future operations while focusing on the current fight. The tools for implementing command decisions include orders, SOPs, communications, and digitized systems.

C^2 GUIDELINES

Some basic guidelines to improve successful C^2 using digitized systems are listed below:

- Commanders must clearly communicate their battle intent and information needs and information operation requirements to eliminate confusion and the potential for information overload.
- Commanders and leaders at all subordinate levels must accurately and succinctly forecast their information needs to support planning and mission execution.
- Commanders should request backbriefs when they give subordinate commanders a new or revised mission through digital or voice means to ensure that they understand the commanders' intent and scheme of maneuver.
- Commanders and leaders at all levels must guard against micro-management of their subordinates with increased SA and precision maneuver and movement capabilities.
- Staffs must be trained to operate BOS systems in an integrated and synchronized manner.

- Commanders must ensure that SOPs address the requirement to conduct daily precombat checks of all digital systems and report the status of critical components. These are critical to maintain uniform SA and combat information.
- Efficient operations and use of the digitized systems depend on the soldier's maintenance skills. These skills must be constantly practiced in both garrison and field environments. The complexities of network establishment and interconnection must be practiced on a weekly if not daily basis. At a minimum, the entire network should be exercised monthly to ensure soldier's skills do not erode.
- Digital SOPs must address automation security requirements (to include system and message handling, safeguarding, and destruction), when necessary.
- Digital SOPs must emphasize the need to include the integration, use, and synchronization of digital systems during pre-execution rehearsals and battle drills.

NOTE: TTPs need to be developed to address the manner in which control and coordination is effected with those engineer units that are not FBCB2 equipped but provide support to brigade and below maneuver elements.

ORGANIZATION AND RESPONSIBILITIES

Changes to the FXXI engineer battalion's organization and responsibilities include expanded roles for the battalion XO and S6 and consolidation of CSS assets within the BSC. These changes are summarized in *Table 2-1*. The engineer battalion's BMO is now the engineer support platoon leader of the BSC.

In a FXXI environment, the ENCOORD is responsible for engineer support throughout the BDE area of operations. Like maneuver battalions, the engineer battalion may not place C^2 or other assets in the BSA or with the FSB HQ except when dicated by METT-TC. A corps engineer unit working the BSA normally exercises the FSB engineer function under the control of the DIVEN battalion. When no corps engineer units are allocated, the ENCOORD must consider the cause and effect of not supporting the brigade rear with DIVEN assets.

Table 2-1. FXXI organizational and responsibility changes

Position	Change
XO	• Principal information manager for the commander • Lead member of the ATCCS management organization
S6	• Principal manager for all signals operations, automation and network management, and information security
Battalion maintenance officer (BMO)	• Position deleted from the engineer battalion • Engineer support element leader of the BSC

The battalion commander determines the C^2 organization that best supports his method of operation. The C^2 organization of his supported brigade influences his decision. Once he decides on the organization, he organizes his staff, determines the succession of command, and assigns responsibilities. The unit SOP establishes the C^2 organization.

The following paragraphs are a guide for how key personnel in the battalion function and support the mission. The engineer battalion

commander determines roles and responsibilities that best fit his organization based on the experience and capabilities of his subordinates.

BATTALION COMMANDER

The battalion commander is the brigade engineer (ENCOORD) and principal advisor to the brigade commander. He—

- Commands all organic and supporting engineer units.
- Analyzes and restates the mission.
- Designs the concept of operations.
- Organizes the engineer forces.
- Transmits his own and the higher commander's intent.
- Provides support to subordinate units.
- Controls the ongoing battle.
- Provides planning guidance for future operations.

EXECUTIVE OFFICER

The XO is the principal assistant to the battalion commander. He is free to move to any point in the AO to accomplish his duties and responsibilities. He—

- Is the battalion's chief of staff and is second in command to the battalion commander.

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- Is responsible for orchestrating the battalion's orders process.
- Is responsible for the operation of the tactical operations center (TOC).
- Is the principal integrator of CSS.

COMMAND SERGEANT MAJOR (CSM)

The CSM's primary role is to advise the commander on matters concerning the soldiers in the battalion. He—

- Understands the administrative, logistics, and operational requirements of the battalion.
- Is the most experienced enlisted soldier in the battalion and keeps abreast of organizational matters.
- Receives taskings from the battalion commander and acts as a troubleshooter throughout the maneuver brigade sector.
- Focuses attention on functions critical to the success of the operation.
- Organizes and lays out the battalion assembly area, as necessary.
- Conducts liaison, leads advance or quartering parties, assists in the CSS effort, and monitors unit morale.
- Must be equipped with a vehicle and a communications system that allow him to travel and communicate long distances in varied terrain.

ADJUTANT (US ARMY) (S1)

The S1 ensures that unit strength, personnel, discipline, and law and order are maintained. He supervises and coordinates all personnel- support activities which.encompasses the areas of—

- Personnel service-support functions.
- Strength accounting, replacement operations, and casualty reporting.
- Administrative services.
- Chaplain activities.
- Legal services.
- Postal services.
- Morale.
- Public affairs.

INTELLIGENCE OFFICER

The S2 collects combat intelligence. In the absence of a dedicated S2 officer, the battalion intelligence NCO or another staff officer (as an additional duty) may perform the S2's functions. The S2—

- Analyzes, coordinates, and integrates engineer intelligence with the brigade S2.
- Produces intelligence products to support the IPB and orders process.
- Keeps the commander and staff updated on the enemy situation.
- Is the principal advisor to the commander on enemy engineer capabilities and limitations.

ASSISTANT BRIGADE ENGINEER

The ABE integrates engineer operations into the brigade. He participates in

- Producing brigade plans and orders.
- Developing EBA products.
- War gaming COAs.

In the absence of the brigade engineer and S3, the ABE advises the brigade commander on engineer operations.

OPERATIONS AND TRAINING OFFICER

The S3 plans, organizes, and coordinate the battalion's and supporting units' engineer operations. He is the officer in charge

(OIC) of the ABE section. In the absence of the brigade engineer, the S3 advises the brigade commander on the current and future employment of engineers. He coordinates with the DIVEN and TF engineers and maintains the current operational status of engineer units supporting the brigade.

SUPPLY OFFICER (US ARMY) (S4)

The S4 is the primary staff officer in the areas of supply, transportation, and field services and provides logistics information to the commander. He—

- Serves as the logistics planner, focusing on future operations.
- Coordinates with the brigade S4 and company XOs on the status of equipment and supplies.
- Plans, coordinates, and supervises the logistical effort, to include coordinating all aspects of CSS in *paragraph 4* of the battalion order and engineer annexes.
- Coordinates with the forward support battalion (FSB) commander and support operations officer to ensure that the battalion commander's logistics priorities are understood and supported.
- Keeps the engineer battalion XO and HHC commander informed on logistics status.
- Functions as the battalion's purchase officer, as needed and authorized.

SIGNAL OFFICER (S6)

The S6—

- Develops the battalion's communications plan.
- Advises the commander on employing communications methods.
- Monitors and reports on the battalion's maintenance status.
- Ensures that both digital connectivity and analog communications are maintained with subordinate, superior, and lateral units.
- Monitors communications security (COMSEC).

CHEMICAL NCO

The battalion's chemical NCO or another staff officer (as an additional duty)—

perform the chemical NCO's functions. The Chemical NCO—

- Advises the commander on the probability and impact of enemy NBC employment.
- Disseminates chemical-activity reports to subordinate units, higher HQ, and lateral units.
- Monitors the battalion's chemical equipment and supply status.
- Recommends mission-oriented protective posture (MOPP) level.

CHAPLAIN

In the absence of a dedicated chaplain, a chaplain from another unit (on an area-support basis) may perform the chaplain's functions. The chaplain—

- Advises the commander on unit morale, spiritual well being, and esprit.
- Provides religious services and personal counseling.
- Coordinates special staff actions with the S1.

HHC COMMANDER

The HHC commander is located with the engineer battalion ALOC in the engineer support area (ESA) with the ESE leader. He assists in the logistics support operations. He—

- Functions as the engineer battalion CSS coordinator, assisting the S1, S4, and ESE leader by ensuring that BSC support is smooth and efficient.
- Is the OIC of the ESA.
- Coordinates the flow of information and the logistical status for engineers between the TFSA, the ESA, and the BSA through coordination with the

engineer company commanders, the engineer support-platoon leader, the engineer support officer, and the brigade support officer.

- Maintains status on all battalion equipment except the COMSEC. Assists in procurement of Class IX supplies (repair parts) and recovery operations.
- Coordinates with the engineer battalion XO to ensure that maintenance activities are planned, coordinated, and synchronized through the battalion.
- Makes decisions affecting CSS operations in the absence of the XO.

HHC FIRST SERGEANT (1SG)

The HHC 1SG is located in the engineer battalion ALOC. He—

- Assists in executing logistical support.
- Is the NCOIC of the ESA.
- Directs the company supply sergeants in the formation of the logistical packages (LOGPACs).
- Is responsible for security of the ESA and coordinating with the tenet units, the battalion CSM, and the FSB S3.

PERSONNEL AND ADMINISTRATIVE CENTER (PAC) SUPERVISOR

The engineer battalion PAC supervisor is located in the engineer battalion ALCO. He—

- Performs personnel service-support functions.
- Performs strength accounting, replacement operations, and casualty reporting.
- Coordinates with the medical section leader to ensure that patient treatment and evacuation are planned and coordinated throughout the battalion.

ENGINEER SUPPORT-ELEMENT LEADER

The engineer support-platoon leader is the battalion CSS executor. He focuses on CSS operations forward, operating from the ESA. He—

- Is the engineer battalion CSS executor.
- Provides all classes of supply, food service, and tactical field maintenance to the engineer battalion.
- Serves as the OIC of the battalion unit maintenance collection point (UMCP).
- Controls maintenance support and establishes maintenance guidelines for the maintenance section.
- Shifts the assets of his engineer combat repair teams (ECRTs) to respond to the workload.
- Coordinates the CSS effort with the HHC commander, the engineer battalion XO, the base-support commander, and the brigade-support operations officer.
- Organizes and runs the battalion's maintenance program.
- Coordinates DS maintenance with the ESE and BSC.
- Prepares maintenance status reports using *DA Form 2406*.
- Anticipates and plans for maintenance requirements.
- Advises the commander on the impact that the maintenance status will have on current and future operations.
- Keeps the DIVEN and brigade S4 advised on the battalion's maintenance status.

FACILITIES

The engineer battalion establishes a tactical CP, a main CP, and an ALOC and uses its ABE section in the plans area of the brigade main CP (see Appendix B). The engineer coordinator (ENCOORD) cell in the maneuver brigade main CP is directly supported by the engineer battalion main CP that is normally located at or in the brigade main CP. Tie-in of the engineer battalion CP to the brigade CP allows for planning and coordination in concert with the brigade. The commander might be located with the brigade command group or forward, leading an engineer TF. For example, the brigade commander could make the engineer battalion commander the breach-force commander in a brigade deliberate breaching operation, requiring the battalion commander to position himself forward in the fight.

NOTE: The commander uses the FBCB2 system in his vehicle to monitor the current SA for any mission he is assigned.

The addition of the ATCCS in the engineer main CP and the increased battle space covered by the maneuver brigade allows the engineer main CP to perform those functions that were the tactical CP's functions. Near real-time SA allows the commander, the XO and/or, the S3 with the battle staff to track, control, and redirect engineer assets with greater ease and mission accomplishment. Obstacle plans and enemy obstacle hazard information is now disseminated to all maneuver and engineer assets as they are employed or discovered. The SA factor allows the main CP to conduct its planning and coordination functions with or parallel to the maneuver brigade's planning process and with a greater degree of understanding.

The engineer battalion main CP is positioned where planning and coordination can be accomplished in concert with the brigade. The battalion commander determines the location based on the engineer mission and capabilities of his staff and the ability of the ATCCS components to interface with the maneuver brigade's ATCCS. For example, the battalion commander may decide to locate his TOC with the ABE section in the brigade main CP to consolidate and better control a 24-hour TOC. He may also decide to maintain a separate planning tent for concurrent planning. Regardless of the layout, the battalion main CP must be able to plan, control, and monitor combat operations.

The ALOC is established forward of the BSA in an ESA. The ESA is headquartered by the ALOC and the engineer battalion HHC. The ESA is an area from which corps engineers (combat mechanized, wheeled, CSE, bridge, combat heavy, and such) stage operations and where their supporting maintenance (organic and DS) reside. The same applies to EOD and any other units which are part of the "engineer force" task organization. The ESA will include a distribution node for corps throughput for use by corps engineers and possibly the DIVEN. The ESA will include a multiunit UMCP to maintain all vehicles, divison and corps, in the engineer force task organization. This ESA may or may not be part of a wider brigade forward support area (BFSA), depending upon the allocation of EAD engineer forces. The engineer battalion ALOC (-), with responsibilities as an engineer logistical liaison center and brigade rear engineer duties (METT-TC dependent), may be located in the BSA.

TACTICAL CP

The principal members of the tactical CP are the—

- Commander, as required.
- S3, as required.
- Tactical officer (OIC).

The primary functions of the tactical CP are to—

- Monitor the tactical situation.
- Track the decision support template (DST).
- Assist the commander to see the battle space and communicate with subordinates.

The secondary functions of the tactical CP are to—

- Anticipate engineer changes.
- Give early warning to subordinate units.

The tactical CP can be located with the—

- Engineer TF.
- Brigade tactical CP.
- Engineer main effort.

MAIN CP

The principal members of the main CP are the—

- Commander, as required.
- XO (OIC).
- S3, as required.
- Assistant S3.
- S2.
- S1/S4, as required.
- Operations sergeant.
- Communications sergeant.
- NBC sergeant.

The primary functions of the main CP are to—

- Serve as the net control station (NCS) of the battalion's ATCCS networks.
- Monitor the tactical situation.
- Manage engineer assets (synchronization matrix and time line).
- Report to the higher HQ and monitor flanks.
- Prepare an in-depth EBA and provide results to the ABE and brigade staff.
- Conduct the tactical decision-making process.
- Prepare the engineer annex and/or engineer portions of the brigade order.
- Prepare operation orders (OPORDs) for missions assigned to the engineer battalion.
- Plan future operations.

The secondary functions of the main CP are to—

- Back up command of the battalion.
- Control the engineer close fight when ordered.

The main CP can be located close to or with the brigade main CP.

NOTE: The main CP accomplishes these actions through its ATCCS. The key to the operation is maintaining SA within the CP and throughout the battalion. The MCS-ENG will allow the command to have near real-time SA and to conduct those combat C^2 functions that have always been performed in the tactical and main CPs. MCS-ENG also provides a detailed engineer-specific planning and resourcing tool.

ABE SECTION

The principal members of the ABE section are the—

- S3 (OIC).
- ABE.
- Operations sergeant.

The primary functions of the ABE section are to—

- Participate in brigade planning for future operations.
- Integrate and synchronize engineer operations.
- Execute deep operations.
- Monitor the tactical situation.

The secondary functions of the ABE section are to—

- Alternate as the CP for the engineer battalion main CP.
- Send reports to the higher HQ.

The ABE section is located with the brigade main CP.

The redesign of the FXXI engineer battalion includes redesignating the battalion rear CP as an ALOC. The following outlines the ALOC personnel, functions, and location on the battle space. *Appendix B, Figure B-4a, page B-5,* depicts the battalion ALOC.

ADMINISTRATIVE LOGISTICS OPERATIONS CENTER

The principal members of the ALOC are the—

- HHC commander (OIC).
- HHC 1SG (NCOIC)
- S1/S4.
- Engineer support-element leader.
- Engineer maintenance technician.
- PAC supervisor.

If an engineer logistical CP is established in the BSA, principal members would include—

- S1 OIC.
- S4 NCOIC.
- Personnel staff NCO (PSNCO).

The primary functions of the ALOC are to—

- Conduct the logistics estimate as part of the orders process.
- Anticipate the battalion's logistical requirements.
- Prepare the A&L annex to plans and orders.
- Receive administrative reports and requests for supplies from the companies and process them through the brigade ALOC, base support company (BSC) Support Operations Officer (SPO), or BSA, as applicable.
- Monitor the battle and status of all classes of supply, maintenance, and personnel.
- Keep the higher HQ (division engineer and maneuver brigade) informed on the battalion's CSS status.
- Plan, coordinate, and execute battalion reconstitution.
- Function as the NCS of the A&L communications network.
- Monitor the tactical situation (maintain situational awareness.
- Establish a logistical CP in the BSA, when needed.

The secondary functions of the ALOC are to—

- Supervise brigade rear-area engineer operations.
- Serve as the staff engineer to the BSA.
- Prepare to assume the functions of the main CP.

The ALOC can be located with the brigade ALOC or BSA main CP.

NOTE: The ALOC conducts all the above functions using the FBCB2 and the CSSCS. All logistic requests come through the FBCB2 to the S4, who then consolidates the requests to the BSC. All planning and the orders process is conducted using the MCS-ENG system back to the engineer S3.

The HHC commander functions as the LO to the brigade ALOC and the BSA. The ALOC plans and coordinates the CSS plan. The BSC in the BSA is the central point for CSS execution. Elements of the S1 and S4 sections use the ALOC as their base for planning and coordination. See *Chapter 6* for a detailed discussion of the mission, functions, and organization of the ALOC.

THE PLANNING PROCESS

The tactical decision-making process is a systematic approach to formulating tactical plans. Troop-leading procedures (TLP), the estimate of the situation, METT-T, and IPB

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are the processes that are used. These processes are interrelated (see *Figure 2-1*). They are accomplished based on the amount of time and resources available. There is a discussion in the following paragraphs on—

- Conducting TLP.
- Commander and staff actions.
- Integrating the estimate of the situation, METT-T, and IPB into TLP.

TLP, although continuous, are not a cut-and-dried process. There are no distinct start and stop points. The steps are not always performed sequentially; some can occur simultaneously. For example, the less time a unit has the more it must adjust or abbreviate TLP.

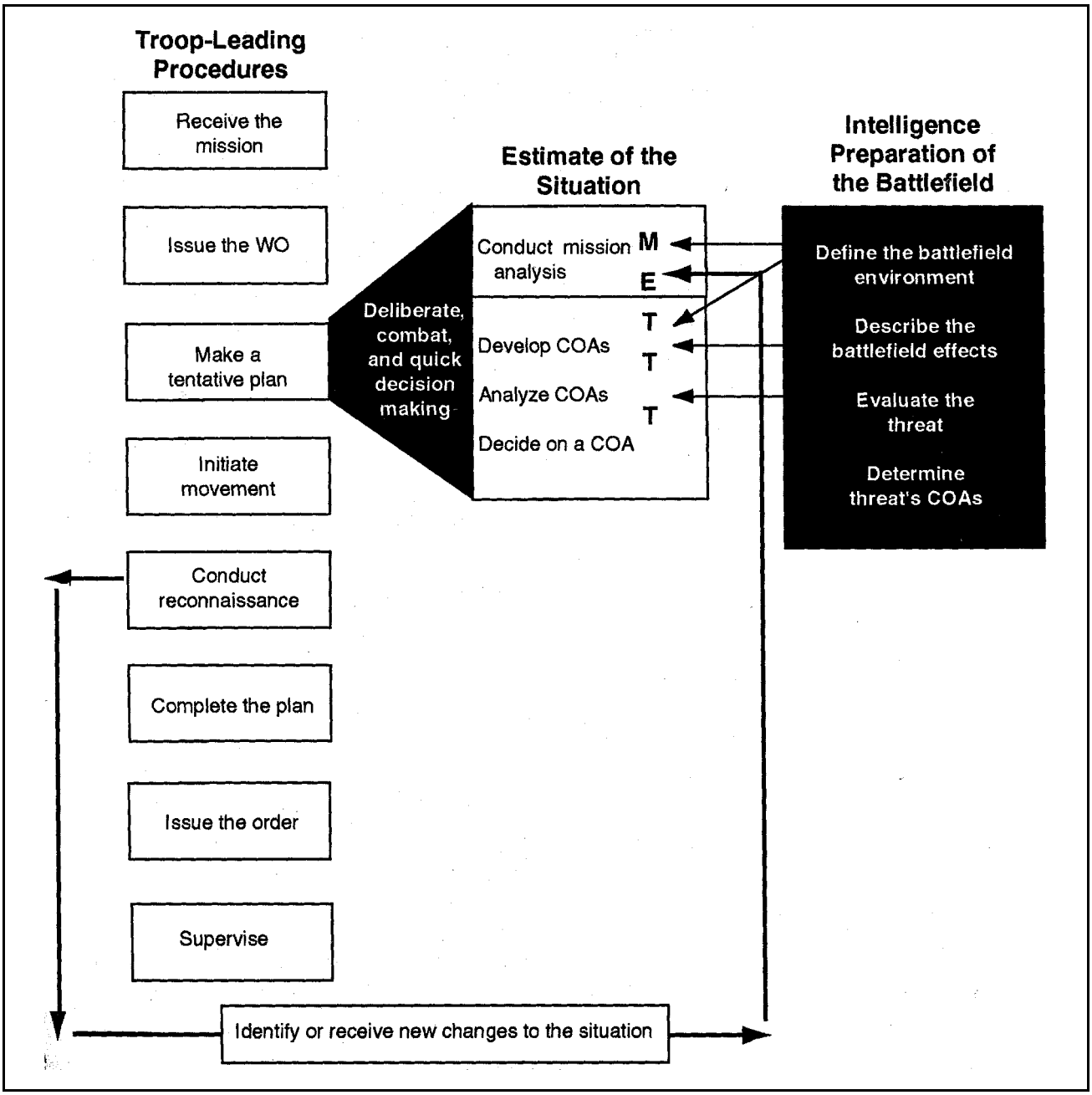


Figure 2-1. Relationship between TLP, estimate of the situation, METT-T, and IPB

The collection, analysis, and distribution of information is a continuous staff requirement. Information that the engineer staff section analyzes is exchanged with other staff sections and used to update the situation. To successfully execute the mission, the engineer staff must focus on the information that the brigade and the engineer commanders need (horizontal versus vertical). The engineer battalion conducts all of the above procedures to include the engineer estimate, as its method for supporting the brigade's tactical decision-making process (see *Table 2-1a).*

The FXXI engineer battalion will use the MCS-ENG's planning tool to assist in the tactical decision-making process. The staff will use the MCS-ENG and DTSS terrain information and products to conduct the IPB and the engineer estimate. These products are then fed into the maneuver brigade planning cell to support ongoing planning. *Table 2-1a* illustrates this relationship and the digital systems used to enhance the decision making process and engineer estimate.

NOTE: The ability to gather and share large amounts of predictive intelligence via digital systems greatly enhances the war-gaming and COA developmental process. The brigade engineer may be able to speed the war-gaming process and arrive at a single COA more quickly based on a continuous feed of near real-time information relative to enemy engineer locations, movements, and dispositions.

The engineer estimate is a logical thought process that supports the estimate of the situation and the brigade's orders process. It is continuously refined and conducted concurrently with the maneuver brigade (see *Table 2-1a and Table 2-2, page 2-13*). The engineer estimate has a specific purpose. It—

- Allows the integration and synchronization of M/S.
- Drives the coordination between the engineer battalion and maneuver brigade staffs.
- Drives the development of engineer plans, orders, and annexes.

The tactical decision-making process is the planning framework for the combined arms staff. The staff engineer must be familiar with the process, moreover, he must be familiar with how he participates and coordinates with the brigade staff. The engineer commander, XO, and S3 must understand the brigade's decision cycle as it influences their planning at the brigade and engineer battalion levels (see *Figure 2-2, page 2-14*).

In the following paragraphs, there is a discussion on how the engineer commander and staff support the brigade's planning process. It is important to note that the main focus of the battalion HQ is supporting the maneuver brigade and subordinate companies.

RECEIVE THE MISSION

TLP begin with the receipt of a new mission. A unit normally learns of a new mission through a warning order (WO) from the higher HQ, followed later by an OPORD. A mission could also be announced in a fragmentary order (FRAGO) as a change to the current operation, or it can be deduced by the commander as a result of ongoing operations. A unit should begin planning as early as possible. The higher HQ should take no more than one-third of the available time it has to issue its order. Likewise, each successive unit has the same obligation to issue its order in a timely manner.

The engineer commander and staff focus on the following essential components of the basic order and engineer annex:

- Enemy situation.
- Mission paragraph.
- Task organization.
- Service-support paragraph.
- Engineer annex.

From these components, the engineer commander and staff determine the—

- Type of operation.
- Enemy and friendly situations.
- Assets available.
- Time available.

Table 2-1a. Engineer estimate aspects relating to decision making at the maneuver brigade and the engineer battalion level

Military Decision-Making Process	Engineer Estimate	Actions to be Taken
Mission receipt	Receive the mission	Sources of Information • Enemy situation, from the situation paragraph and the intelligence annex • Mission paragraph • Division's task organization • Service-and-support paragraph and annex • Engineer annex • ASAS feeds Determines • Types of operations (offense, defense) • Assets available • Current intelligence picture • Time available (initial estimate) Deliverables • Digital Topographic Support System (DTSS): 2-3 terrain blowups of the AO (hard-copy and web-page posting) • MCS-ENG/TBASE: Line of sight for OPs and retrans sites • MCS: - ABE's input into the BCT WO 1 - .JPG files of objective or other intelligence • Engr bn: WO 1 (via MCS)
Mission analysis		
	IPB/EBA: Terrain analysis	Sources of Information • Brigade S2 • Unmanned aerial vehicle (UAV) • TerraBase II "fly through" on terrain • Ground reconnaissance (engineer recon) Determines • Effects of the terrain on friendly and enemy maneuver • AA • Critical LOC (earthmoving requirements for mobility) Deliverables • DTSS: MCOO for AO (soil, trafficability, and slope analysis) - UAV photo blowups - Blowups and analysis of objectives, BPs, and other key terrain • MCS-ENG/TBASE: Analysis of terrain to determine critical intervisibility lines in AO • MCS: Dirty battlefield overlay is sent to the TFs and all the BCT's C2 elements (TAC, TOC, and ALOC)
	IPB/EBA: Enemy mission and M/S capabilities	Sources of Information • S2's order of battle • Doctrinal template of enemy engineer organizations • Enemy engineer personnel/equipment capabilities • Current activities (such as SALUTE report—especially from engineer recon) • ASAS feeds Determines • Situation template (SITEMP) of enemy engineer activity and location • Tentative employment of specific engineer equipment and capability critical to the mission (for example, SCATMINES and breaching assets) Deliverables • DTSS: Blowups and analysis of objectives, BPs, and other key terrain for use by engineer or other recon elements • MCS-ENG/TBASE: Weapons fans to template enemy BPs and obstacles (include on BCT S2's SITTEMP • MCS/ASAS: SITMAP or message on enemy SITTEMP (include time/distance analysis • Engr bn S2 or ABE: Enemy obstacles (templated and confirmed) are added to the BCT S2's SITTEMP

Table 2-1a. Engineer estimate aspects relating to decision making at the maneuver brigade and the engineer battalion level (continued)

Military Decision-Making Process	Engineer Estimate	Actions to be Taken
	IPB/EBA: Friendly mission and M/S Capabilities	Sources of Information • Engineers task organized to the brigade • Refined time estimate • Known unit work rates • Availability of critical resources Determines • Estimate of the total engineer capability for the mission • Impact of new information on the mission; this process is continuous • Critical resource impacts on the mission Deliverables • DTSS: Blowups and analysis of objectives, BPs, and other key terrain for use by engineer or other recon elements • MCS-ENG/TBASE: - Line of sight for OPs and retrans sights - Weapons fans to develop BPs and support-by-fire positions, and so forth • MCS/ASAS: SITMAP or message on enemy SITTEMP (include time/distance analysis • Engr bn S2 or ABE: Enemy obstacles (templated and confirmed) are added to the BCT S2's SITTEMP
	Analyze the engineer mission	Sources of Information • Division order • Division engineer annex Determines (all ABE deliverables to mission analysis brief) • Specified M/S tasks • Implied tasks (analyze the mission with facts and assumptions) • Assets available for the entire brigade TF (such as changes to the engineer task organization) • Limitations (constraints and restrictions, such as FASCAM release authority, CSRs, or other logistics issues) • Risk, as applied to an engineer capability - Engr bn: Force XX1 risk assessment for engineer battalion • Engineer specific: PIR, EEFI, and FFIR - ABE or engr bn S2: Engineer recon tasks, time line, NAIs, PIR, MVT plan, resupply plan, logistic plan, casualty evacuation (CASEVAC) plan in an R&S WO - DTSS: Terrain blowups, slope analysis, cross-country mobility overlay (time available will determine hard-copy productions versus web-page posting) - MCS-ENG/TBASE: OP LOS analysis and retrans LOS analysis, engineer recon OP and MOPMS/Hornet LOS analysis and triggers (visible area plot), GSR and Q36 LOS analysis, and LZ locations • Time analysis - ABE (NCOIC): Section time line is developed for the TDMP through the orders production and the backwards plan is developed using the one-third to two-third rule, allowing for reproduction limitation - Engr bn: Engineer battalion mission analysis is conducted using the terrain blowups • Essential tasks (specified and implied tasks that are critical to the mission) • Restated mission
	Develop the scheme of engineer operations	Sources of Information • Brigade commander/engineer battalion commander/S3 • Maneuver COAs • Relative combat-power analysis

Table 2-1a. Engineer estimate aspects relating to decision making at the maneuver brigade and the engineer battalion level (continued)

Military Decision-Making Process	Engineer Estimate	Actions to be Taken
	Develop the scheme of engineer operations (continued)	Determines • Tailoring of the scheme of engineer operations • Engineer priority of effort/support • Higher commander's intent for M/S operations within the brigade sector • Employment considerations of the engineers; the brigade engineer assists in the staff's maneuver COA development • Tailored engineer scheme of operations for each maneuver COA • Engineer missions and allocation of forces/assets Deliverables • ABE: - Obstacle-belt planning and blade-hour estimate (on MCS-ENG) as well as breach-lane requirements are used to quickly evaluate each COA to determine if adequate assets are available to support them - CCIR, obstacle intent, task organization, priorities, and time line are verified - Engineer annex to BCT WO 2 - Engineer scheme of operations is integrated into the maneuver COA (continuous process) • Engr bn: - Engineer battalion restated mission statement - Time line with rehearsals and engineer battalion order issue time - Engineer battalion WO 2 (including restated mission commander's intent AO, CCIR, risk guidance, recon, security, deception, M/CM/S, time line) • MCS: - WO 2 with overlay SITMAPS and other .JPG files - SCATMINE request sent to division
COA develpment	War-game and refine the engineer plan	Sources of Information • Staff analysis identified the best COA to recommend to the commander • War gaming • Advantages/disadvantages analysis of a given COA relative to another Determines • Scheme of engineer operations that best supports maneuver plan • Weaknesses in the engineer plan to make adjustments, such as— - Shifting assets to the main effort (review SCATMINE asset allocation) - Shifting engineer priorities - Recommending to the commander to accept risk at a specific time - Requesting additional engineer assets from higher headquarters • Integration of enemy engineer assets and actions as the S2 plays the enemy force • Engineer scheme of operations that best supports mission accomplishment Deliverables • DTSS: - 2-3 terrain blowups of AO (laminated for COA sketches and war gaming) - Soils analysis for plowing and digging - Terrain products are finalized for unit distribution • MCS-ENG/TBASE: Range fans, IV line analysis • MCS: "No dig" overlay SITMAP and other .JPG DTSS blowups • ABE (NCOIC): SCATMINE planning is requested • Engr bn: Decision graphics (critical events and refined situation obstacle triggers)

Table 2-1a. Engineer estimate aspects relating to decision making at the maneuver brigade and the engineer battalion level (continued)

Military Decision-Making Process	Engineer Estimate	Actions to be Taken
COA analysis	Recommend a COA	Sources of Information • Combined staff analysis of the COAs during war gaming • Higher and adjacent engineer unit task organizations Determines • Recommendation to the commander on which COA is best (engineer prepared to inform the commander where risk must be accepted or what additional assets are required to avoid/reduce risk)
COA approval and orders issuance	Finalize the engineer plan and issue orders	Sources of Information • Commander's approved COA • Initial mission analysis (identify all specified/implied tasks) • Approved engineer scheme of operations Determines • Final engineer task organization • Final coordination with the staff on approved COA • Input to basic OPORD (scheme of engineer operations, subunit instruction, coordinating instructions, and engineer annex) • Engineer participation in the OPROD brief Deliverables • DTSS: Blowups (if not already issued), UAV photos, .JPGs, and terrain product digits are included • MCS-ENG/TBASE: Hard copy of critical products are included with the OPORD • MCS: Obstacle overlay • ABE: Engineer annex with obstacle overlay • ABE (NCOIC): Direct construction of rehearsal terrain model (include all known and templated friendly, enemy, and existing obstacles) • Engr bn: - Engineer battalion order with obstacle overlays - Engineer battalion commander's refined intent and rehearsal preparation

Table 2-2. Relationship of the engineer estimate to the engineer annex

Engineer Estimate	Content	Engineer Annex Format
Develop the scheme of engineer operations for— • Force allocation • Task organization	Task organization of engineer units (includes who they support and in what command/support relationship)	Task organization
Conduct IPB	Aspects of the weather, terrain, and enemy M/S activities that significantly impact engineer missions	1. Situation a. Enemy
Conduct EBA of the— • Terrain • Enemy M/S capability	Missions and plans of higher and adjacent engineers that impact on the current planning should be identified	b. Friendly
Develop higher HQ OPORD and engineer annex	Changes in task organization which occur during the execution that need to be clarified	c. Attach/detach
Receive restated mission from the supported unit	Mission statement of the supported unit	2. Mission
Develop the scheme of engineer operations	Concept of the engineer operations to support the maneuver	3. Execution a. Scheme of engineer operations
	Details on the use of obstacles and SCATMINES	b. Obstacles c. SCATMINES
Analyze mission	Missions to engineer units: • Task-organized to brigades • Under brigade troops	d. Subunit missions
War-game and refine the engineer plan	Instructions common to two or more engineer units	e. Coordinating instructions
Develop the scheme of engineer operations	Allocation of M/S mission resources that should be identified	4. Service support a. Command-regulated supplies
Allocate resources	Method of mission sustainment	b. FSP locations
	Method of unit sustainment	c. Transportation d. Medical e. HN assistance
Finalize the engineer plan	Location of engineer CPs Special C^2 arrangements required reports	5. Command and signal

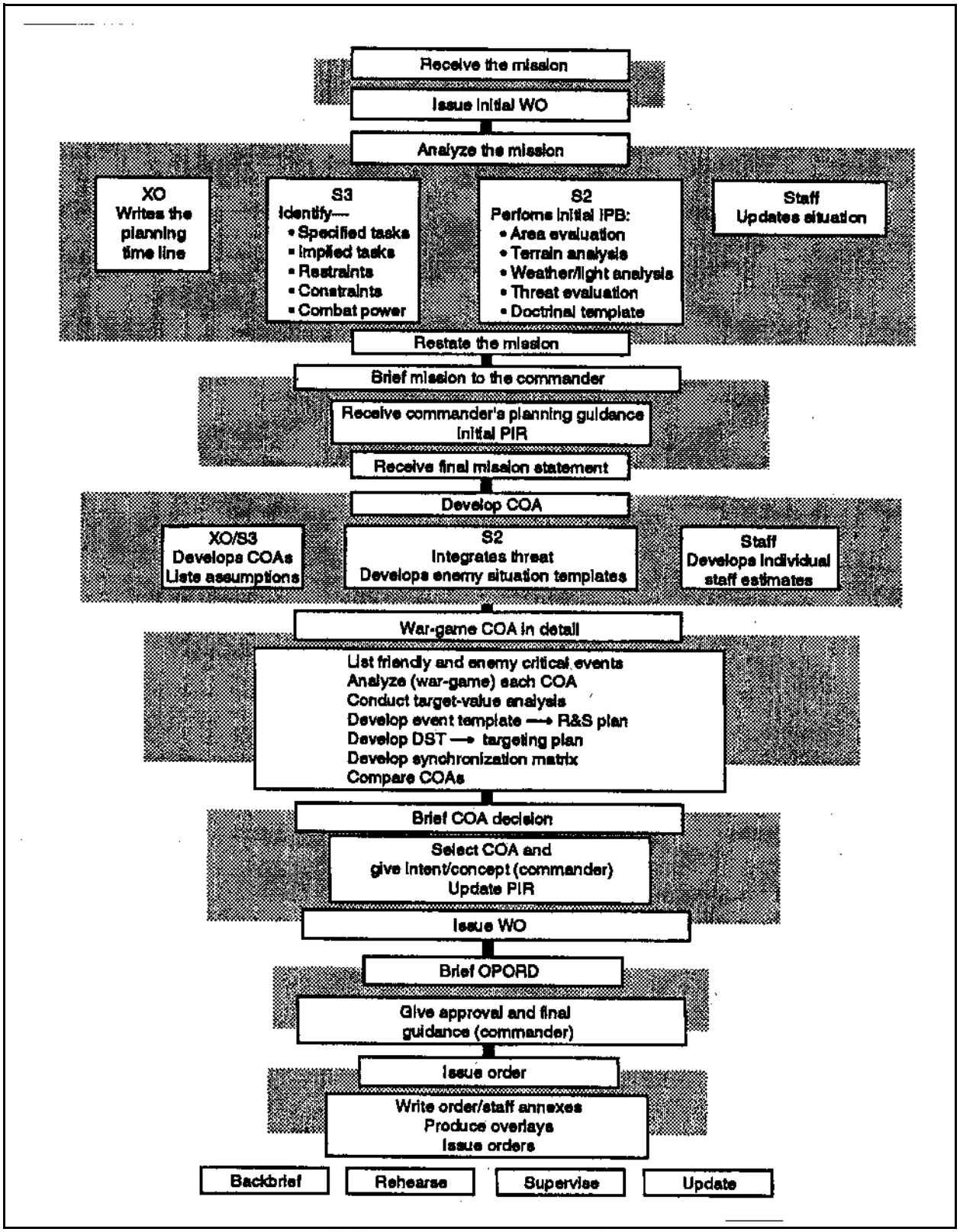


Figure 2-2. The brigade planning process

When the engineer commander learns of a new mission, he should issue an initial WO to subordinate units, informing them of the nature and time of the new mission. The engineer staff convenes and conducts the mission analysis. It normally conducts parallel planning during the estimate of the situation. The engineer XO or representative closely monitors the maneuver brigade's planning and attempts to conduct concurrent planning in the battalion TOC. The engineer S3 constantly exchanges information with the battalion TOC to facilitate the process.

ISSUE A WO

The engineer commander should issue a WO to units immediately after the brigade commander issues his planning guidance. The WO should be brief but contain enough information for the units to prepare for the mission. Additional WOs can be issued later to keep units informed and allow parallel planning to occur. WOs normally do not have a specific format; however, some of the following information should be in them:

- Enemy and friendly situations (brief).
- Changes in task organization.
- Earliest time of move.
- Nature and time of the operation.
- Time and place the OPORD is issued.
- Other specified tasks.

MAKE A TENTATIVE PLAN

The process that forms the basis for the entire operation is performed in this step. The time factor is a major influence on how the estimate of the situation is performed. The tactical decision-making processes are—

- Deliberate.
- Combat.
- Quick.

The time factor highly influences these processes. The most common process that the brigade conducts is the combat decision-making process (CDMP). The CDMP facilitates the demands of the ongoing operation by matching the realities of the high-tempo battlefield where windows of opportunity for action are fleeting and tactical demands continuously challenge the command. The CDMP is used during operations when the command may be executing and planning up to three operations simultaneously. Normally, in the CDMP, a friendly COA is wargamed against enemy COAs.

Mission Analysis

The first step of the command estimate process is the mission analysis.

Determine the Facts and Assumptions. The brigade or engineer battalion staff presents the maneuver brigade/engineer commander with facts and assumptions for the mission analysis and the development of COAs. The information pertains to both friendly and enemy situations. The engineer staff officer assists the commander in developing facts and assumptions by—

- Participating in the IPB.
- Conducting the EBA.

The IPB centers on templating the enemy, anticipating its capabilities, and predicting its intentions based on threat doctrinal norms and the order of battle. The engineer must understand the brigade S2's doctrinal and situation template so that he can analyze enemy engineer capabilities and the order of battle. The situation template becomes the foundation for the maneuver S2/engineer S2, S3, and ABE coordination. During threat evaluation and integration the brigade S2 and the engineer must work

together. For example, obstacle intelligence (OBSTINTEL) and templating are developed in concert with the brigade S2's templating of a motorized rifle battalion's defense. The engineer S2 uses the situation template to further develop intelligence requirements (IR), PIR, and named areas of interest (NAIs) to support the event template and the reconnaissance and surveillance (R&S) plan. The engineer S3 or ABE, through the brigade S2, ensures that OBSTINTEL collection is integrated into the R&S plan.

The EBA is used as the framework for developing facts and assumptions. It consists of three parts. They are—

- Terrain analysis. The first component of the EBA is to analyze the terrain. The engineer develops facts and assumptions and supports the IPB process through the EBA. He analyzes the terrain and weather and assesses their impact on military/engineer operations. The terrain is analyzed using the following military aspects of terrain:
  - Observation and fields of fire.
  - Cover and concealment.
  - Obstacles.
  - Key terrain.
  - Avenues of approach (AA).

The function of the terrain analysis is to reduce the uncertainties regarding the effects of natural and man-made terrain on friendly and enemy operations.

Analysis of the military aspects of terrain is accomplished primarily through the preparation of the modified combined obstacle overlay (MCOO). The ABE and the engineer S2 assist the brigade S2 in developing the MCOO. It is the basic product of the battlefield-area-evaluation phase of the IPB process. The MCOO is the graphic terrain analysis on which all other IPB products are based. A slope overlay (for example, Terra-Base) can be used to determine trafficability and intervisibility for intelligence collection, target acquisition, weapons capabilities, and obstacle integration within the brigade AO. These products are used for COA development and analysis (see *Table 2-1a and Appendix C.*

- Enemy mission and M/S capabilities. The second component of the EBA is to analyze the enemy engineer mission and M/S capabilities. The first step is to understand the enemy's mission and consider its doctrinal use of engineers. The engineer S2 uses the maneuver S2's doctrinal and situation template to develop the enemy engineer order of battle. He further assesses the enemy's M/CM/S capabilities and templates its effort and location. In coordination with the S2, the engineer S3 or ABE recommends IR/ PIR, attempts to augment the reconnaissance effort, and monitors the collection of intelligence to confirm or deny the situation template.

In the defense, the engineer templates the enemy's—

- Mobility capabilities and location in its formation.
- Use of SCATMINEs.
- Engineers that support the reconnaissance effort.
- High-value targets (HVTs) (bridging and breaching assets).

In the offense, the engineer templates the enemy's—

- Tactical- and protective-obstacle effort.

commander must consider the amount of time needed for the unit to accomplish troop-leading tasks. The time analysis produces a schedule of activities (time line) that must occur. Finally, as a part of the mission-analysis brief, the XO recommends the time line for the operation.

Issue Commander's Guidance. This may be the first time the brigade or the engineer commander is able to meet with his staff. The briefing includes the tasks the staff identifies and the restated mission it recommends. The commander approves or disapproves the restated mission and issues his planning guidance to the staff. Whether at the maneuver brigade or the engineer battalion level, the commander and his staff should develop a list of priorities to discuss at this briefing. This is the staff engineer's opportunity to raise any questions with the brigade or the battalion commander. The commander's planning guidance consists of the following:

- Restated mission.
- Higher commanders' intents (two levels up).
- His own intent (required).
- COAs for his staff to consider.
- Time and place of decision brief (time line).
- PIR.
- Commander's critical information requirements (CCIR) (his own critical information requirements).
- Effects desired on the enemy force.
- Risk assessment.

The commander's planning guidance is the single most important element of the estimate process. His ability to state his vision for the mission provides the engineer staff with a defined focus that is required to develop and analyze COAs. The engineer commander must provide his guidance as it applies to vertical and horizontal planning. The engineer staff focuses primarily on identifying, integrating, and synchronizing tasks to support the engineer mission (vertical). The S3, ABE, and S2 focus on integrating and synchronizing tasks to support the maneuver brigade mission (horizontal).

Table 2-3. Brigade time line

Time	Event
171200	Receive the mission, then— • Analyze the mission • Establish time line • Issue WO number 1 • Conduct staff estimates • Issue commander's guidance • Develop COA
1500	War-game/compare COA
1800	Brief decision
1830	Issue WO number 2
2230	Brief orders
2400	Distribute orders (R&S)
181000	Rehearse (brigade)

Reconnaissance is normally conducted later; however, the commander may decide to conduct his reconnaissance at this time. Reconnaissance missions that are given to the units could also be issued at this time.

COA Development

A COA is a possible plan that commanders can use to accomplish the mission. It is usually stated in broad terms with the details determined during war gaming. The brigade staff comes prepared with its tools for

planning. The EBA provides a reference for the ABE's and/or S3's participation in the brigade's COA development and analysis. Depending on the time available and the brigade staff's experience, the brigade S3 decides on its level of participation in developing COAs. COA development consists of the following steps:

- Analyzing relative force ratios.
- Arraying initial forces.
- Identifying critical events, enemy and friendly.
- Developing an initial scheme of maneuver.
- Determining C^2 means and control measures.
- Preparing COA statements and sketches.

At a minimum, the engineer S3 and/or ABE ensures that the brigade S3 understands the engineer task organization and available combat power. He develops his scheme of engineer operations to support the COAs. His initial scheme is a rough draft and is refined during the war-gaming process.

COA Analysis

An analysis identifies the best COA for recommendation to the commander. It can begin with the S3 briefing the staff on each friendly COA. At this time, the S3/ABE may identify a COA that is not feasible in his area of responsibility; therefore, it should be eliminated or modified immediately.

War-Game COAs. The XO leads the brigade staff in analyzing (war gaming) each friendly COA against enemy COAs. War gaming is a logical step-by-step process that relies heavily on tactical judgment and experience (see *Figure 2-3).* The analysis process is action, reaction, and counteraction. The war-gaming technique used (AA, box, belt) is based on time and staff training. Detailed war gaming accomplishes the following:

- Achieving the desired end state of a COA.
- Listing advantages and disadvantages.
- Assessing the feasibility of the COA.
- Completing the event template.
- Identifying requirements for CS and CSS.
- Synchronizing combat functions/critical events.
- Completing the synchronization matrix and DST.
- Developing the engineer task organization.
- Developing the brigade OPORD.

Detailed war gaming focuses on the timing aspect of the operation. The friendly COA selected is war-gamed in a deliberate fashion against enemy COAs. A myriad of tasks from the commitment of reserves, close air support (CAS), indirect fire, and the employment of family of scatterable mines (FASCAM) is synchronized. Additional NAIs are identified and included on the event template. Target areas of interest (TAIs) and decision points are identified and annotated on the DST. The DST, also referred to as the revised operations overlay, is the result of detailed war gaming. For more information on war gaming, see *FM 101-5.*

The engineer S3 and/or ABE must be an active player. For example, he must war-game the timing aspects of situational obstacles, obscuration and suppression for combined arms breaching, and the positioning

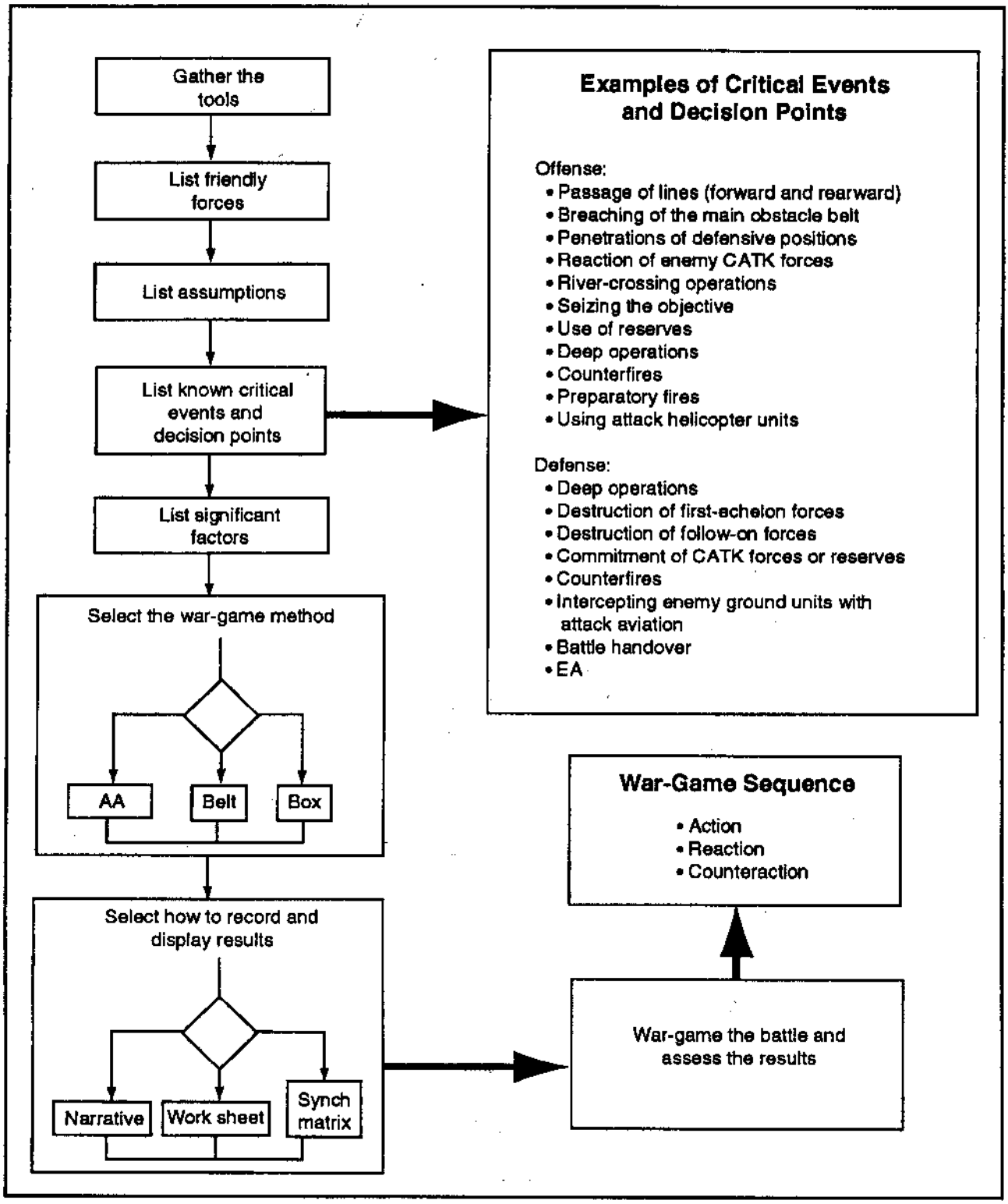


Figure 2-3. War-gaming steps

of forces and material for current and future operations. It is through detailed war gaming that the battlefield is truly synchronized. Understanding basic movement rates and other planning factors is paramount in war gaming.

The fundamental role of the brigade staff is to synchronize and apply all the capabilities of the brigade and contribute to the success of the mission. The staff must record the results of each war game on the synchronization matrix and DST. This ensures that every member of the combined arms team understands when and where they need to apply their capabilities to achieve the effects and outcome the commander expects.

The brigade S3 portrays the friendly force while the brigade S2 interprets the enemy situation template and anticipates enemy actions. The engineer S3/ABE must be ready to interject thoughts and identify critical events/tasks as they apply to his BOS. He identifies engineer tasks and determines if a task is feasible based on the assets available. Also, he must articulate the actions of enemy engineers as the battle is played out. The war-gaming session must assess the feasibility of COAs and capture issues, tasks, and actions that are discussed during the session. The information that is gathered is used to further develop the event template and the synchronization matrix. The engineer uses the information to further develop his scheme of engineer operations.

The engineer battalion develops and wargames COAs; however, its focus is on the vertical piece of the operation. The battalion identifies vertical critical tasks and ensures that the tasks supporting the critical event are feasible and well integrated. The engineer XO leads the sessions and ensures that the information gathered is recorded, coordinated, and monitored. Close coordination between the engineer XO and S3 helps facilitate information flow and supports parallel planning.

Compare COAs. COA comparison consists of comparing options and choosing a COA. The actual comparison may follow any technique which allows a recommendation to be reached. An effective technique for comparing COAs is to use a comparison matrix. Each COA is compared to the others using specific criteria. When comparing COAs, the engineer determines which scheme of engineer operations best supports accomplishing the mission.

Recommend a COA. The brigade staff recommends to the commander the best COA. Each COA is outlined, the advantages and disadvantages of each presented, and a recommendation is made.

Decision/Execution

The brigade commander considers the staff's recommendation and announces his decision and concept/intent. At this point, the engineer commander and S3 can issue another WO to the subunits with updated information from the brigade commander. This facilitates planning at the engineer battalion and the company level. Although decision/execution is the final step of the tactical decision-making process, execution is encompassed in the remaining steps of TLP.

INITIATE MOVEMENT

A new WO, movement order, or FRAGO can initiate the movement of units. Units may have to reposition to start the operation on time. Movement of subordinate units may be necessary to change task organization. Some movement, especially reconnaissance units, may be necessary immediately after

The frequency-modulated (FM) network is the primary method of communications within the battalion. It operates two FM networks: command and A&L. The command network is for passing command traffic, operational information, periodic updates, and short immediate reports. The A&L network is for passing routine reports and coordinating battalion-level service support. *Table 2-5* lists the personnel and facilities that monitor the engineer battalion networks.

Mobile subscriber equipment (MSE) is the primary method of communications with higher units. Mobile subscriber radio telephones (MSRTs) support key decision makers in the battalion. The battalion TOC is normally located with the brigade TOC so that MSE can be wired to the brigade's small extension node (SEN). When the battalion ALOC echelons a logistical node that is located with the BSA, its MSE can be wired to the FSB's SEN.

NOTE: When an MSRT-equipped vehicle is unoccupied, the digital secure voice terminal (DSVT) is remoted to a manned area.

Table 2-5. Engineer battalion networks

Personnel/Facilities	Networks
Battalion commander	Battalion command and maneuver brigade command
CSM	Battalion command battalion A&L
XO	Battalion command battalion A&L
S3	Battalion command and maneuver brigade command
Tactical CP	Battalion command and battalion A&L or brigade operations and intelligence
TOC	Battalion command, maneuver brigade command, and maneuver brigade operations and intelligence
ABE	Battalion command and battalion A&L
ALOC	Battalion command and battalion A&L
Line-company commander	Company command and TF command
Line-company CP	Battalion command and company command

RESPONSIBILITIES

Responsibilities for communications are as follows: subordinate to senior, supporting to supported, reinforcing to reinforced, passing to passed (forward passage of lines), passed to passing (rearward passage of lines), left to right, and readward to forward.

TECHNIQUES

Regardless of the task organization, it is the subordinate's responsibility to keep the commander informed. The eavesdrop technique may be used at all levels. It requires that radio stations be on a specific network for personnel to monitor and use message traffic even if they are not the direct recipients of the message. This allows commanders to stay abreast of the situation without having to respond to reports. Other techniques include—

- Sending reports through the supported unit.
- Sending periodic reports to the higher HQ, as required.

NOTE: This technique is not recommended in the digital environment due to voice and digital contention.

COMMUNICATIONS DISCIPLINE

In the FXXI communications network, voice traffic has precedence over digital messages on the same net to facilitate timely communication during enemy contact. FBCB2 can store digital communications in a queue in a limited manner until a sufficient pause exists on the net to send the transmission. This requires strict radio discipline on each net to help eliminate voice/data contentions, particularly during enemy contact. It may require the sender to transmit the entire message again due to partial or failed completion of the transmission. The FBCB2's knowledgment settings can be set to have the receiving station's device require the operator to physically acknowledge receipt of information to verify its arrival. *Figures 2-4 and 2-5* show the communications network for a FXXI engineer battalion.

RADIO DISCIPLINE

Radio discipline and proper training ensure that digital messages/reports are received in a timely manner and that the force is alerted to critical "time sensitive" battle space information. Precise procedures for when and how to send digital information on voice/data nets should be outlined in unit SOPs and OPORDs and rehearsed during unit combined arms rehearsals.

During precombat and postcombat phases of an operation, the battalion should enforce use of digitized information exchange to the greatest extent possible. This reduces the units voice transmissions that are more likely to be pinpointed by enemy direction finding equipment, more susceptible to jamming or intentional interference measures, and more likely to be monitored by listening devices. Use of FBCB2 messaging and BOS component systems data transmissions ensures better SA among the battalion by providing key leaders graphical displays of unit positions and current information.

INFORMATION SECURITY (INFOSEC)

Commanders must ensure that adequate security methods designed to protect against accidental or intentional computer viruses are addressed and are in place. These measures should be set up to prevent destructive viruses and personnel from disrupting the tactical information flow and thereby endangering the mission.

INFOSEC measures prevent unauthorized persons from gaining valuable information from communications sources. Included in INFOSEC are all electronic security (ELSEC), COMSEC, operations security (OPSEC), and physical security procedures. Measures to ensure INFOSEC should be simple and efficient while maintaining effectiveness. Procedures that are burdensome will impact on the flexibility and usefulness of information assets.

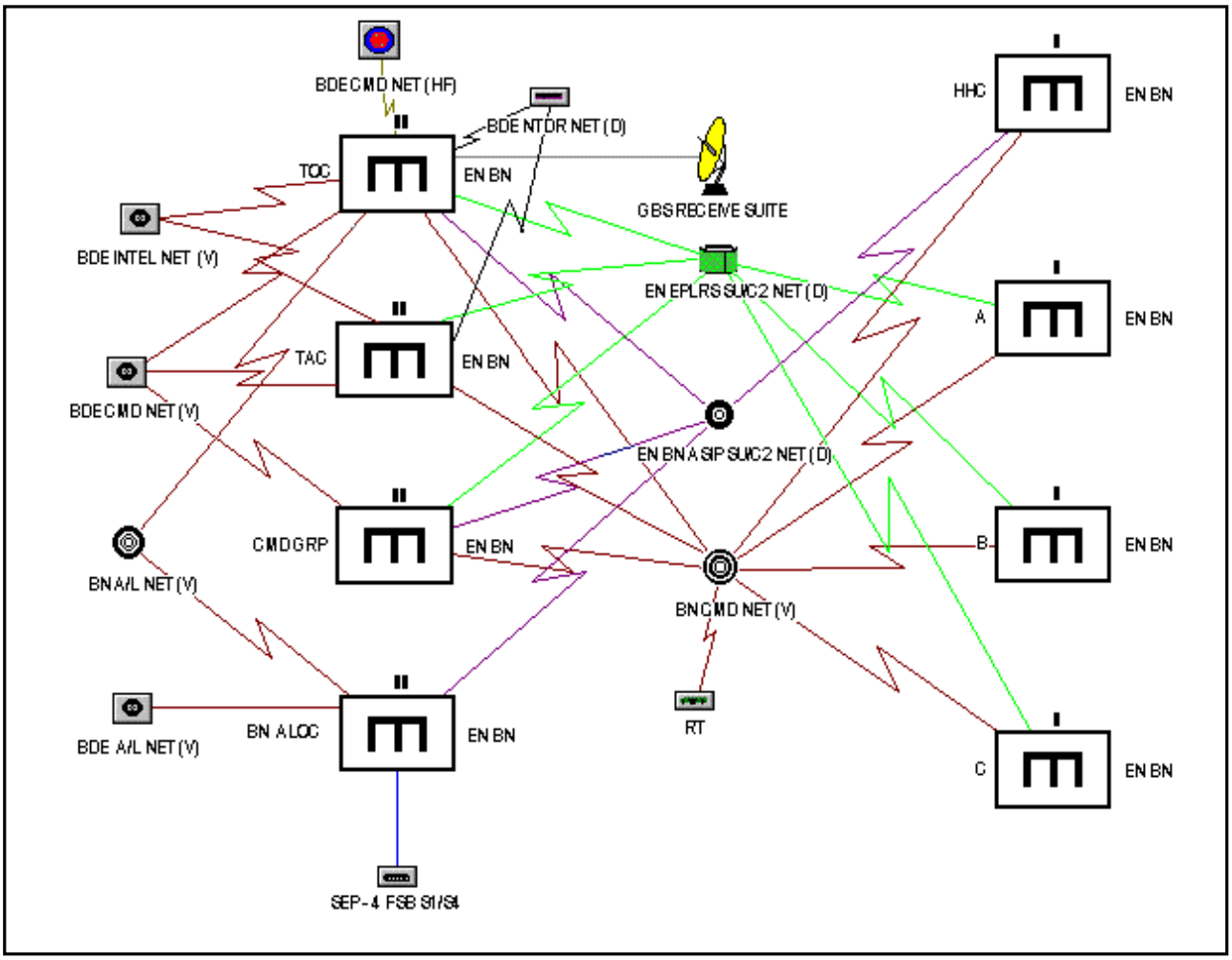


Figure 2-4. FXXI engineer battalion communication network {BN TOC stand-alone [with S6 NTDR], BN ALOC colocated with BDE ALOC in BSA)

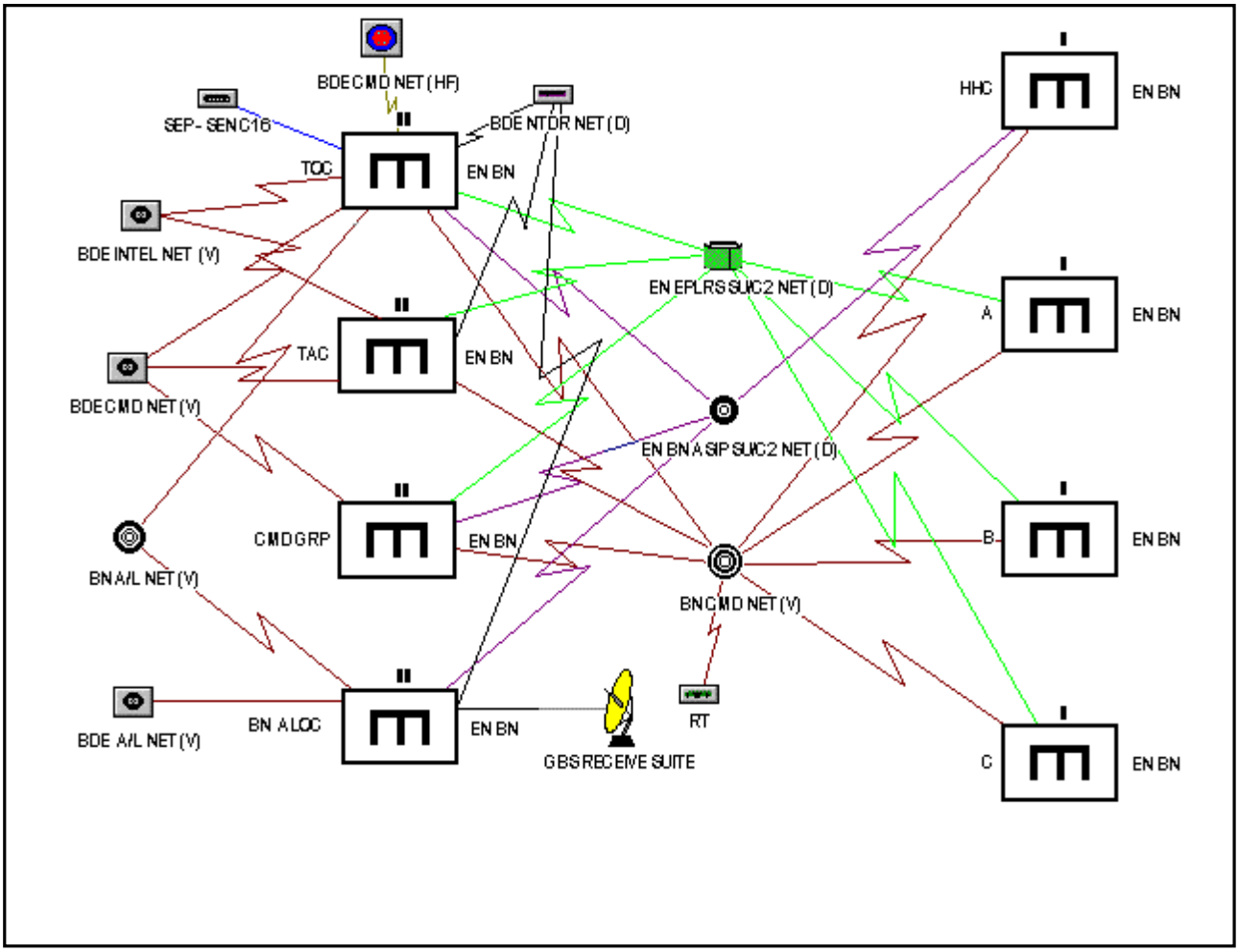


Figure 2-5. FXXI engineer battalion communication network (BN TOC colocated with BDE TOC)

CHAPTER 3

Offensive Operations

The primary purpose of the offense is to destroy the enemy and his ability and will to resist. Offensive operations are designed to defeat the integrity of the enemy's defense system by driving into its rear area and destroying artillery; reserves; C^2 platforms, systems and nodes, weapons platforms, and sustainment centers. Offensive operations may also be conducted to secure key or decisive terrain, deceive or misdirect uncommitted enemy forces, fix or isolate units, gain information, or spoil an enemy's offensive preparation. Brigades are normally tasked to conduct offensive operations independently, as a contingency force, or internally as part of a corps or division offensive or defensive operation.

Improved navigation, target acquisition, and the introduction of information-sharing capabilities enhance the ability of the FXXI division to conduct sustained offensive operations. FBCB2 and MCS-ENG enable engineer elements at brigade and below to use the protection and security afforded by terrain, without loss of orientation or SA. At brigade level, combat information (to include contact reports, spot reports [SPOTREPs], and revised operational graphics) that is necessary to sustain synchronization with corps and division level HQs is digitally passed between ABCSs in real time or near real time. The cumulative effect of the brigade's advanced digital capabilities is a more tactically agile and lethal force capable of operating with higher operational tempos than analog brigades.

This chapter provides an emerging doctrinal foundation for the brigade engineer when applying and using digital systems to conduct planning and coordination and to support offensive operations. It also addresses the EBA, the tactical decision-making process, and how digital systems can compliment and focus engineer planning and preparation to enhance flexibility and responsiveness. Understanding how the engineers fit into the maneuver brigade's framework is a prerequisite to effective offensive engineer planning. This manual serves as an engineer extension to *FM 71-3, Chapter 3,* and examines how brigade engineers fit into the maneuver brigade's offensive framework and contribute to successful offensive operations.

While the roles of engineers in the offensive framework and the focus of engineer planning are the same for both heavy and light forces, their tactical capabilities and the manner in which they may be employed are different. When operating together in a light-heavy mix and augmented with digital systems, these forces and their engineer support can be highly lethal. Light and heavy divisions apply the same five basic forms of maneuver. In the FXXI division, the use of technologically advanced systems and sensors aid the division's engineers supporting the division's maneuver.

Brigades normally conduct offensive missions in support of a division or corps operation. These missions include serving as the—

- Main attack.
- Reserve.
- Follow-and-support.
- Supporting attack.

The factors of METT-T may require that the brigade be task-organized differently for each mission. Brigade resources are almost always limited. The engineer battalion is task-organized forward and prepared to conduct reconnaissance and M/CM operations.

Battles are fought in depth. The brigade engineer must understand the brigade's offensive framework—deep, close (reconnaissance/security, main and supporting attacks, and reserves), and rear operations. For more information on these elements, see *FM 71-3*.

OFFENSIVE CHARACTERISTICS

The offense is the commander's primary means of gaining the initiative. Through constant offensive pressure on the enemy, he is best able to force the enemy to conform to his intent and retain his own freedom of action. Even in the defense, the commander seeks to regain the initiative through offensive action at the earliest opportunity.

As a result of digitization, offensive characteristics have not changed; however, a FXXI division can execute these characteristics with greater precision and speed. For example, the commander of a FXXI division, using information derived from both air (such as UAV, Joint Surveillance Target Attack Radar System [JSTARS], Rivet Joint) and ground sensors (such as Raptor ICO, AN-TPQ-37 radar, Improved Remotely Monitored Battlefield Sensor System [IREMBASS]) can gain an early appreciation for the enemy's location, disposition, and direction of movement. Friendly locations, capabilities, and limitations are shared between the FBCB2 and the MCS. Digital systems and the information shared between them shorten operational planning and preparation and facilitate faster tactical decision making. For example, the brigade commander, based on his ability to develop the situation early, can modify his concept of operation and scheme of maneuver based on real- or near real-time data. Using this information, the commander can maneuver his forces at a time and location of his choosing to commence a surprise attack or ambush. Based on his guidance, the staff digitally prepares and disseminates an OPORD, a FRAGO, or a WO and accompanying digital overlays that address these changes. Once receiving this changed guidance via their C^2 digital systems (ASAS-RWS, MCS, FBCB2), the battalion TFs can then adjust priorities, rapidly reorganize, and initiate movement. Precision movement and maneuver are enhanced using such systems as the FBCB2 and the Enhance Position-Location Reporting System (EPLRS).

The success of the attack depends on the proper application of the following offensive characteristics:

- Surprise.
- Concentration.
- Tempo.
- Audacity.
- Flexibility.

Concentration is achieved by narrowing the zone of the main attack, thereby achieving an advantage of combat power at the point of attack. Brigade commanders balance the requirement for concentration against that of presenting a lucrative target for enemy CATKs by indirect conventional or nuclear fires.

Surprise, tempo, and audacity provide the depth and the agility required for successful brigade operations. Surprise is achieved by attacking at unexpected locations and times. In the offense, the FXXI engineers are focused on ensuring the commander has the flexibility required to conduct speedy movement and is focused on rapidly overcoming existing and reinforcing obstacles or supporting deep-strike operations. The speed with which engineers conduct these mobility operations is key to maintaining operational tempos. Advanced engineer systems such as the Grizzly and the Wolverine enhance engineer flexibility and the speed with which water and man-made obstacles can be breached in order to maintain the operational tempos of the maneuver force. These mobility operations may be augmented by

the more survivable Bradley mounted engineer squads. Operating in BFVs or M113s, these squads are capable of performing engineer reconnaissance that provides terrain and intelligence information. When equipped with the Digital Reconnaissance System (DRS) and Raptor ICO sensors, reconnaissance operations are enhanced. The squads are also able to conduct obstacle reduction and lane marking. Tempo and audacity provide the speed, mass, and decisiveness that create the desired pressure on the enemy.

The allocation and task organization of engineer forces is based on the IPB/EBA and the mission analysis conducted during offensive planning. To accomplish his mission planning and support tasks, the brigade engineer must thoroughly understand the commander's intent and scheme of maneuver. He must also anticipate engineer support requirements based on his knowledge of the maneuver brigade's missions and understanding of both enemy and friendly capabilities.

Based on his mission analysis, the brigade engineer identifies the number of maneuver lanes required for each of the maneuver brigade's TFs to conduct offensive operations. He subsequently compares engineer mission requirements against available resources. As necessary, he will request augmentation from division or corps engineer assets to ensure total coverage throughout the brigade area of operation.

At the point of attack, the brigade must create the conditions to mass combat power. The brigade engineer focuses his efforts on maintaining the momentum (tempo) of the attack and allowing the brigade combat team to mass and overwhelm the enemy. He conducts reconnaissance and mobility operations to sustain the tempo at the point of penetration (POP).

The need to generate enough mass strongly influences which echelon can conduct a breaching operation (see *Table 3-1). A* company team generally cannot simultaneously mass sufficient fires, breach the obstacle, and also assault the defending position unless it is a simple obstacle defended by no more than a squad. A TF has sufficient combat power to attack an obstacle defended by a company and is normally the echelon used to conduct the breach.

The brigade has sufficient combat power to attack a complex and well-defended obstacle but has difficulty deploying all its combat power within range. Normally, the brigade breaches by isolating a small segment of the defense (platoon or company) that a TF can attack as the breaching echelon. If the obstacle and defense are in-depth (large-scale), brigades would normally receive additional support (such as artillery, engineer, and aviation) from the division for large-scale breaching operations.

The main feature of an offensive battle is destroying the enemy. OBSTINTEL provides the critical information required to locate enemy weapon systems and fire sacks. Based on this information, the brigade seeks to avoid the enemy's strength by-

- Preventing it from occupying its defensive positions.
- Isolating its forces from sources of support.
- Forcing it to fight in an unintended direction.

To conduct combined arms breaching and other mobility operations, the division engineer battalion can task organize engineer companies with the maneuver TFs or, as a technique, he can constitute an engineer battalion task force to serve as the breach force during a brigade breach operation.

Table 3-1. Types of breaching operations versus enemy size

Maneuver Unit	Instride	Deliberate	Assault	Covert	Enemy Size Overwatching Obstacles
Brigade	X X	X √	X	X	MRB MRC MRP
Task Force	X	X √	X	X X	MRB MRC MRP
Company		X	X	X X	MRB MRC MRP
X – Type of breach normally conducted √ – Possible variation depending on scheme of maneuver					

BOS INTEGRATION AND SYNCHRONIZATION

In offensive operations, the battalion staff identifies critical tasks and events that must be war-gamed to determine when and where combat, CS, and CSS assets are applied to achieve mass and synchronization. *Table 3-2, page 3-4*, lists critical tasks for offensive operations; it focuses on the critical tasks that must be integrated (coordinated) and/or synchronized (predict time and effect).

TACTICAL OFFENSE AND THE BRIGADE ENGINEER

The general forms of the tactical offense are—

- Movement to contact (MTC).
- Attack.
  - Hasty.
  - Deliberate.
  - Spoiling.
  - CATK.
  - Raid.
  - Feint and demonstration.
- Exploitation.
- Pursuit.

The brigade is trained and task-organized to pass from one operation to another without delay. The type of operations may be conducted in sequence in a successful battle, beginning with a MTC to locate the enemy and ending with the destruction of the enemy through pursuit. These forms of maneuver are enhanced with the use of digital systems and are performed by the heavy and the light divisions.

MOVEMENT TO CONTACT

A MTC is conducted to gain or reestablish contact with the enemy. It is used to develop the situation early to provide an advantage before decisive engagement. The brigade conducts a MTC as part of a larger formation. The FXXI brigade will receive intelligence update reports from the division and EAD air (UAV, JSTARS, Rivet Joint, and Quickfix), and ground sensors (IREMBASS, Hornet-PIP sensors, Long-Range-Acquisition Scout Sensor Suite [LRAS3], and Hunter Sensor Surrogate System [HS3]) identifying the enemy's main strength.

Planning

Planning begins by conducting the mission analysis, identifying tasks, and allocating forces. Typical tasks are—

- Combined arms breaching.
- Countermobility (tactical employment to protect flanks and support the attack/transition to defense).
- Reconnaissance (technical and tactical).
- Route clearance and marking.

The engineer S3/ABE identifies and war-games critical engineer tasks. His objective is to integrate and synchronize the tasks with other BOSs. For example, all offensive operations require a combined arms breaching capability. In a MTC, the brigade engineer considers the enemy situation and allocates forces accordingly. He task-organizes his forces with the brigade advance guard and forward TFs to support in-stride breaching. He anticipates and assigns a "be-prepared" deliberate breach mission. The brigade engineer's thought process includes the breaching tenets (intelligence, mass, synchronization, organization, and fundamentals) as he conducts the decision-making process (see *FM 90-13-1, Chapter 2*).

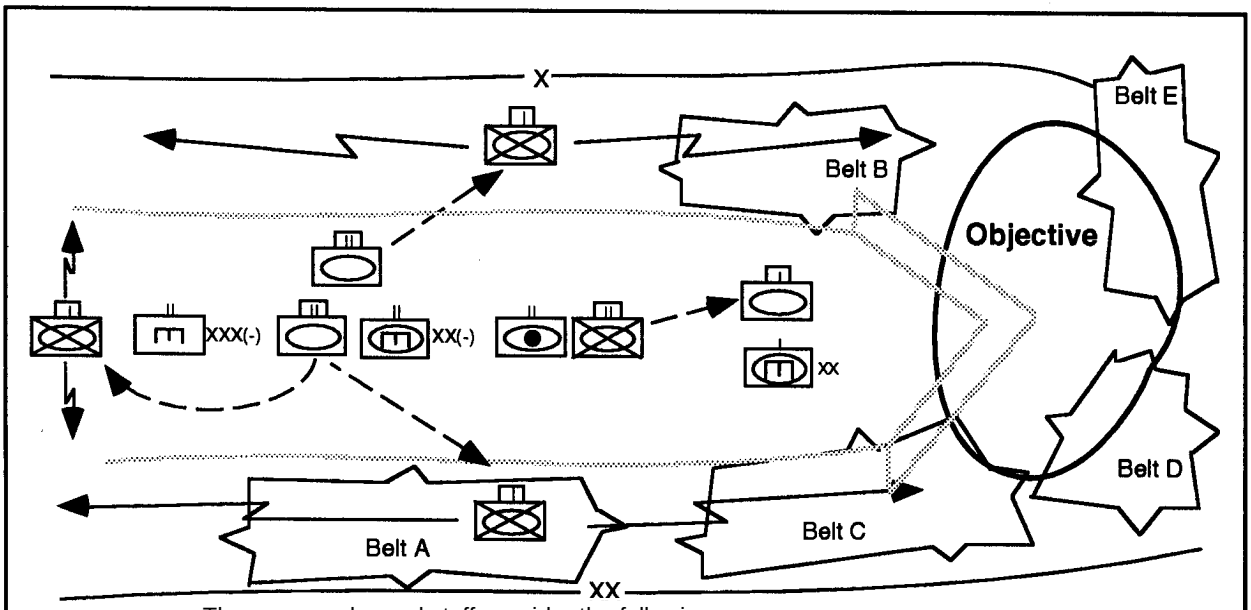
Table 3-2. Critical tasks for BOS integration and synchronization

Battlefield Operating Systems	Critical Tasks
Intelligence	• Template expected enemy engineer assets. • Analyze enemy missions and combat capabilities, includes weapons and their effective ranges. • Analyze enemy engineer organizations and their manpower and equipment capabilities. • Estimate and template the capabilities of the enemy to employ SCATMINEs, NBC, and survivability and to emplace conventional minefields. • Analyze recent enemy activity (intelligence updates). • Identify **AAs** from the flanks during the attack and the need for flank protection. • Identify AAs upon consolidation and support the transition to the defense. • Use the MCOO for templating. • Recommend IR and PIR and integrate them into the R&S plan. • Review all templates (doctrinal, situation, event, and DST). • Recommend HVTs (SCATMINE delivery systems). • Integrate engineer reconnaissance forces into R&S collection plan. • Use intervisibility overlays and TerraBase to position forces and analyze fire control.
Maneuver	• War-game and determine the type of breaching operation required. • Focus on the allocation of forces to accomplish the mission. • Conduct reverse planning from actions on the objective, • Identify engineer critical tasks to support the scheme of maneuver. • Focus on synchronization (war-game and time the breach). • Identify mechanical breaching capability (include the number of plows). • Identify acceptable force ratios for assault and support forces. • Record situational obstacle employment on the DST/synchronization matrix.
M/S	• Determine engineer critical events and actions (war-game). • Identify the main effort. • Allocate engineer forces to meet the requirement. • Develop the synchronization matrix and time line. • War-game SCATMINE employment. • Check C2 (who does what). • Template enemy use of NBC (monitor and report). • Determine MOPP level for breaching operations.
FS	• Conduct a TVA and recommend HVTs. • War-game with the FSO to determine artillery effects and the CFZ at the POR • Determine the number of volleys required to achieve the effect. • Identify observer locations for SCATMINE targets. • Check the positioning and timing of artillery support. • Check the FS overlay and target list.
AD	• Ensure ADA coverage of breaching points and critical movement routes.
CSS	• Develop Class IV/Class V requirements. • Coordinate with CSS representatives (brigade S4 and FSB) to accomplish CSS requirements. • Identify limitations and get additional support. • Check UMCP locations and prioritize maintenance recovery. • Position recovery assets to best support forward units. • Anticipate losses and request replacements, • War-game and predict casualties (when and where). • Monitor the request for Class IV/Class V materials and haul support.
C^2	• Integrate and synchronize engineer operations through the brigade's decision-making process (deliberate, combat, or quick). • Synchronize during war gaming (determine the timing aspects of the breaching operation). • Identify strengths and weaknesses in the COA. • Identify C2 requirements for the staging and movement of follow-on forces and equipment. • Identify the breaching operation as a critical event and reverse plan. • Track the DST/synchronization matrix. • Determine the location of the commander, S3, and XO to influence the battle.

The brigade staff, normally the brigade and engineer S3s/ABE, war-games the use of tactical obstacles. Emplacing conventional minefields in the offense is difficult and requires a realistic time estimate. Belts or brigade-directed obstacles are planned to protect flanks and support a meeting-engagement battle. The brigade staff war-games this scenario based on time phase lines (TPLs) for the two converging forces. The engineer S3/ABE, with the help of the maneuver *S-9*, the S3, and the FSO, synchronizes the use of situational obstacles. They focus on getting the right obstacle to the right target at the right time. See *Figure 3-1* for the engineer force laydown for a MTC.

Preparation

The engineer SWABE continues to refine the plan. He coordinates with the other staff officers to ensure that engineer tasks are integrated into the maneuver plan. The engineer S2 monitors the intelligence updates and provides information to the commander and staff. The S2 takes this information and updates the appropriate templates. The brigade engineer may recommend changes based on this input. The brigade engineer and his staff monitor precombat inspections (PCIs) and supervise rehearsals. The commander is the key player at the brigade rehearsal. He talks through critical engineer missions, tasks, actions, and decisions as the battle is played out. It is important that adequate time is



The commander and staff consider the following:

- Positioning engineers with the advanced guard to provide mobility/countermobility.
- Maintaining a vertical link with engineer companies for a potential transition to a deliberate breach or hasty defense.
- Planning belts to protect flanks and to support actions on the objective.
- Planning and war gaming the use of SCATMINE systems.
- Limited survivability for hasty defense.
- Engineer reconnaissance to obtain intelligence on the enemy's disposition information on how the terrain affects movement.

Figure 3-1. Engineer force laydown for a MTC

considered before rehearsals are decided on. Extensive planning is required to execute full-scale rehearsals correctly. Time influences the rehearsal technique that is used for a given mission (see *FM 90-13-1, Appendix D).*

Execution

The brigade engineer normally directs the fight from the brigade command group. He monitors the battle and reports the status of significant engineer events as they occur. Staff officers also monitor activities and report the status to the higher HQ. Battle maps and status charts are maintained. During the battle, the engineer—

Tracks enemy and friendly locations and critical events.

Tracks the DST/synchronization matrix and keeps the commander informed.

Tracks the employment of enemy and friendly SCATMINE systems.

Sends SCATMINE warnings to subordinate units.

Tracks battlefield losses and requests replacements.

Tracks the positioning of Class IV/ Class V supplies.

Note: The above are normal C2 functions for all combat operations.

ATTACK

The two major types of attacks are hasty and deliberate. The other types of attacks will not be discussed in-depth in this chapter; however, the same engineer fundamentals and considerations apply to each type of attack. Spoiling attacks, CATKs, raids, feints, and demonstrations require obstacle breaching and other mobility tasks. Combat engineers may also do some countermobility tasks. Diversionary operations, such as feints and demonstrations, may require engineers to complete the deception. METT-T influences the scheme of engineer operations. For more information on the other types of attacks, see *FM 100-5*.

Hasty

The FXXI brigade, either as an independent force or as part of a division or a corps force, will conduct a MTC after deep-attack mission objectives are accomplished. The MTC of the brigade and the meeting engagement of its battalion TFs are deliberate and based on accurate information related to the location, disposition, and capabilities obtained through airborne, ground, and human sensors. R&S forces and security forces precede the forward advance of the brigade. With enhanced situational and battle space awareness, the brigade commander will launch a HATK based on predictive intelligence that pinpoints known locations where the enemy is concentrating his forces to establish a potential defense. Using real- or near real-time information gathered as part of an on going IPB process, the brigade commander may attack to seize a fleeting opportunity or exploit a success in other sectors. While conducting a defense, he may be better able to regain the initiative based on his ability to focus and concentrate fires on known enemy formations (for example, R&S, AD, artillery, maneuver, and C^2 platforms).

NOTE: If working with adjacent engineer units who are not FXXI-equipped, the brigade engineer must ensure proper coordination of engineer operations, support requirements, and taskings.

The brigade engineer with his enhanced SA has the ability to monitor the tactical situation in real or near real time. With his knowledge of the terrain, he is better able to anticipate and plan for the mobility needs of the HATK force. Through an assessment of the terrain analysis and DTSS products and the review of intelligence in the ASAS-RWS database, the brigade engineer can pinpoint likely avenues of approach into the flanks of the HATK force. Additionally, he can emplace obstacles in support of the scheme of

maneuver to disrupt, fix, turn, or block the enemy CATK force. The brigade engineer is also accountable for survivability and or force-protection tasks if the HATK force is assigned a mission to seize and hold an objective. In this instance, engineer requirements include improving or constructing protective or battle positions and employing obstacles to defend against a CATK. The use of Hornet PIP and SCATMINEs enable the brigade engineer to quickly emplace situation obstacles.

The brigade engineer's enhanced awareness will also enable him to anticipate engineer requirements and quickly transition resources and realign support priorities. (For example, the pursuit of a disorganized enemy may result following the successful seizure of an objective.) Maintaining the momentum of the attack may quickly become a function of the engineers. Based on his enhanced SA and the use of digital systems to effect C^2, the brigade engineer should be able to preposition the forces and resources necessary to support all contingencies that may develop as a result of a HATK.

A HATK is usually conducted following a MTC or when unexpected enemy contact made. The basic principle in conducting the HATK is to seize the initiative. Depending on the disposition of the enemy, a HATK can be conducted against a—

- Moving enemy force.
- Stationary enemy force.

A HATK may be conducted in a number of situations, to include as a planned contingency during a MTC or as an unforeseen contingency during hasty or deliberate defenses and a DATK.

Planning. The brigade engineer supports a HATK by developing a decentralized and flexible engineer task organization. HATKs are always a planned contingency in a MTC. Because the HATK is usually an outcome of the MTC, any intelligence planning will be that which was conducted as part of the MTC planning.

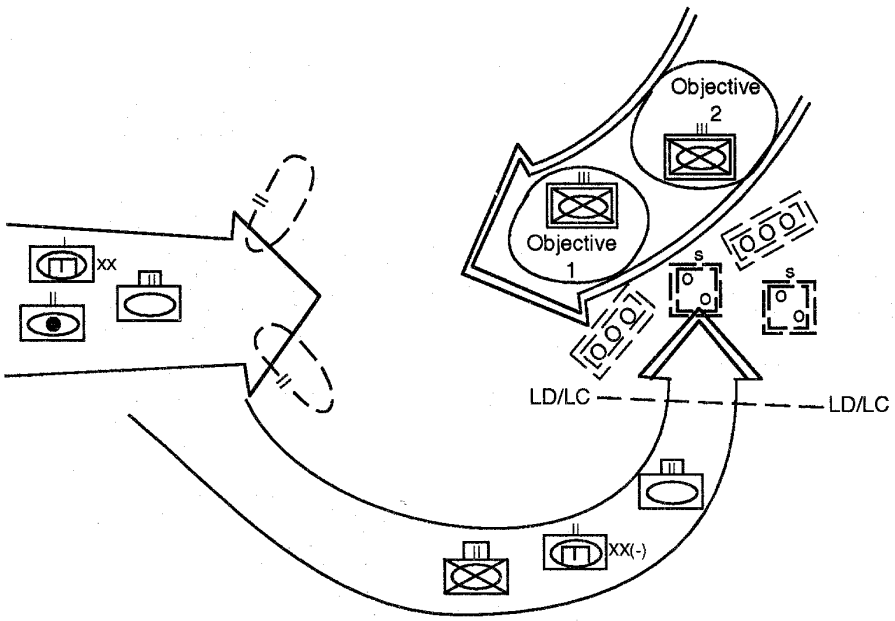
The nature of a MTC requires each maneuver unit to be task-organized with engineer units and have the capability to conduct engineer operations. Since there is no time to shift assets, engineer support to the HATK is based on the existing task organization. Engineer critical tasks identified for the MTC are applicable to the HATK (see *Figure 3-2, page 3-8,* and *Figure 3-3, page 3-9).*

Preparation. The engineer battalion prepares for the HATK while rehearsing the MTC. The brigade commander decides whether to conduct a HATK based on the advice of the S2 and the spot reports from the units in contact; therefore, split-second decisions are required. As a minimum, the commander wants to know the—

- Effort and composition of enemy tactical obstacles.
- Location and intent of enemy obstacles (kill sacks).
- Location of possible bypass routes and the consequences of them.

The commander ensures that subordinates understand their actions upon enemy contact. Rehearsals include actions on contact with enemy obstacles. In-stride breaching is rehearsed as part of the HATK. It is important that the engineer understands his role and that of his combined arms teammates.

Execution. The brigade engineer has a difficult role during the HATK. He must allow his subordinates to develop the situation and make decisions quickly. The C^2 functions that the engineer commander and staff conduct for the HATK are similar to those conducted for the MTC. The brigade engineer must maintain a high state of situational and battle space awareness by closely monitoring the tactical situation. The real- and near real-time information presented in regard to the disposition and activities of both friendly and enemy forces during execution of the attack are of primary concern to the brigade engineer. As a result, the timely sharing of information via both voice and digital systems is essential to effective C^2 of ongoing



The commander and staff consider the following:
- War gaming and determining the feasibility of employing SCATMINE systems.
- Developing the event template to predict when and where the enemy uses SCATMINE systems.
- Ensuring that each TF has a flexible mix of M/CM/S assets for all contingencies.

Figure 3-2. Engineer force laydown for a HATK

engineer actions/activities. The brigade engineer monitors the battle from the command group or lead TF and provides critical information to the brigade commander, as required. Commanders must talk laterally and vertically, developing the situation and maneuvering as a team.

Deliberate

A DATK is characterized by detailed reconnaissance, thorough planning and rehearsal, rapid concentration of forces, surprise, attacks on enemy weaknesses, violent execution, early shift to exploitation, and positive, aggressive leadership at all echelons of command. This type of attack requires massed combat power on a narrow front. A DATK is conducted when offensive operations are directed and—

- A HATK has failed.
- The enemy is well organized and cannot be turned or bypassed.
- Lead time is available for intelligence gathering and offensive operations.

NOTE: The ability of the FXXI division to use national, strategic, and tactical resources to accomplish early identification and disposition of an enemy force and subsequently track his movement and use of terrain enables the division to accomplish a deliberate attack (DATK) after a compressed planning timeline.

Planning. The brigade engineer develops a scheme of engineer operations that focuses on providing mobility support throughout the depth of the attack. The breaching tenets provide the framework for planning the deliberate breach. Breach planning is driven by two fundamental thought processes—the command and engineer estimates. In the development of the situation template, the estimates merge. The ABE, engineer S2, and brigade S2 will develop enemy obstacle and maneuver templates to focus recommended PIR.

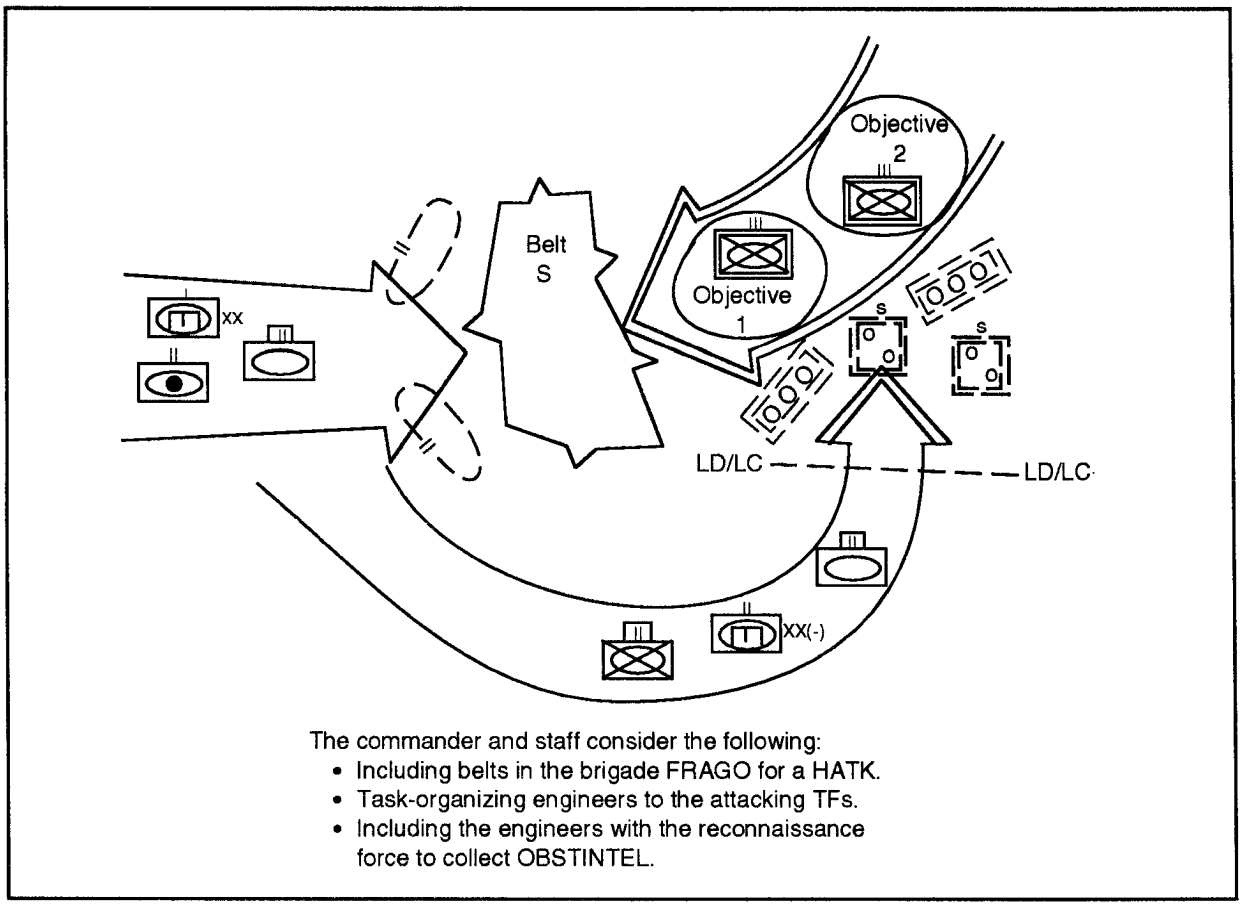


Figure 3-3. Engineer support to a HATK

The brigade staff war-games the breach and identifies the following:

- Timing/intent of FS (suppression and obscuration).
- POP.
- CFZ.
- Cueing guidance (when and where).
- Intelligence electronic warfare (IEW) direction finding, intercepting, and jamming enemy networks (when and what networks).
- ADA coverage.
- CAS.
- Control measures to perform the breach.
- Additional support from the division.
- Movement plan for follow-on forces.

The command and engineer estimates use the following reverse- planning sequence to develop the breach plan:

- Planning begins with actions on the objective.
- Actions on the objective drive the size and composition of the assault force.
- Actions on the objective determine the number and location of lanes to be breached.

- Lane requirements and the type of obstacle drive the amount and type of mobility assets task-organized to the breach force.
- Ability of the enemy's infantry to interfere with the breach determines whether the breaching site is to be secured by fires or by force.
- Ability of the enemy to mass fires at the breaching site determines the amount of suppression that is required. This determines the size of the support force.

During the DATK, a brigade deliberate breach may be required. Items that should be considered when planning breach-force operations include—

- Task organization. Based on the reverse planing sequence, the correlation of forces requirement for the support and assault forces may dictate that the engineer battalion serve as the breach force as a technique. Normally, the breach force is allocated one or more engineer companies depending on the number of lanes to be opened. It may also be allocated maneuver assets (infantry, armor, tube-launched, optically tracked, wire-guided (TOW) antitank (AT) missile launchers, plows), smoke assets, AD assets, and/or MP assets. Normally, these assets are OPCON to or in direct support of the breach force; responsibility for their logistics requirements remains with their parent unit. The brigade engineer/ABE will allocate engineer forces for TF and BDE breaching operations per *Figure 3-4 and Figure 3-5, page 3-13*.
- Routes/assault positions. Routes are planned which follow the movement of one of the maneuver forces. This is to avoid having the engineers fight through uncleared enemy territory. Breach-force assault positions are identified short of the obstacle system to allow the breach force to consolidate and await for the signal to execute the breach. Before the breach force is committed, the support force, artillery, and CAS set up the conditions (effects of smoke and suppression) for the breach. The breach force waits in the assault position until the brigade commander tells them to advance. Both primary and alternate routes and attack positions are planned.
- Quantity and spacing of breach lanes. The number and spacing of lanes are METT-T driven. If the terrain is open and allows adequate maneuver space, the breach force breaches and marks two lanes per TF. Once the assault force is passed and the far side of the lane is secured, friendly forces use one lane for casualty evacuation and one to allow chemically contaminated vehicles and personnel to pass through, as required.
- C2. The number of lanes that is needed determines the task organization and the C2 structure. Normally, each lane is assigned to a platoon reinforced with the breaching assets needed to reduce all obstacles to its front. An engineer company HQ can control reduction efforts on up to three lanes. Maneuver forces are positioned where they can best provide direct FS to the breaching element. They may be in overwatch positions covering the entire obstacle or they may move forward with the engineer platoons as each lane is developed. All company commanders (maneuver and engineer), as well as other combat support leaders (AD, smoke, and MPs), are on the breach force command network. The engineer battalion commander is positioned forward where he can best observe and control the reduction effort and keep the brigade commander informed. The battalion S3 is also forward and ready to assume control of the reduction effort should the need arise.
- Maneuver and fire control. Movement to the breach-force assault position may be as shown in *Figure 3-4*. Maneuver forces could be positioned in a wedge

formation to the front of the breach force. Engineer elements travel in a column behind the wedge formation, with smoke elements moving on their flanks to provide screen support, as required.

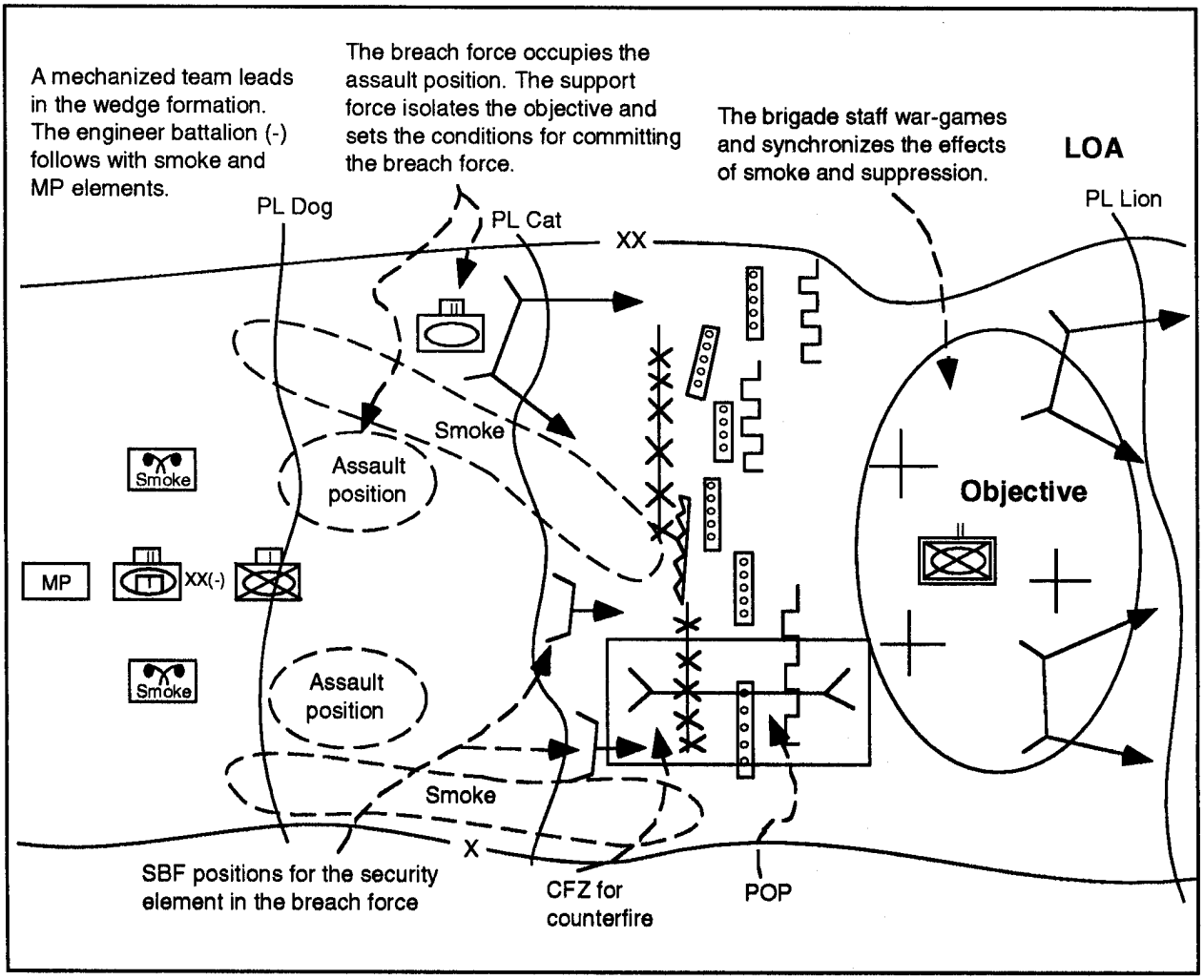


Figure 3-4. TF breach

Once in the vicinity of the obstacle, the maneuver forces' movement is controlled by using attack-by-fire (ABF) or support-by-fire (SBF) positions. These positions are clearly identified on graphics and the execution matrix shows when forces are to move from one position to another. The maneuver forces' role is to provide immediate security for the engineer force reducing the obstacle by providing direct fire on enemy forces within and to the flanks of the obstacle. This is different from the mission of the support force, which concentrates direct and indirect fires on the far side of the obstacle to suppress the main enemy defense. To prevent fratricide, fire-control measures, such as near- and far-side boundaries, are used to delineate which areas the support force fires on and which areas the security element of the breach force fires on. The breach force must be fully aware of the support force's locations. Other considerations include—

- Traffic control. The reduction force in each lane provides initial traffic control. Traffic control is passed to the MPs or other assigned traffic-control elements

The support force isolates the objective and sets the conditions for the breach.

The engineer task force, as the breach force, occupies an assault position in preparation for the breach. Smoke assets maneuver with the support force and breach force to help set conditions.

The assault force trails the breach force and prepares to move through the lanes and clear the objective. Initially, engineers guide the assault force through the obstacle; MPs relieve the engineers to guide follow-on forces.

The brigade staff must wargame the effects of suppression and obscuration to ensure success.

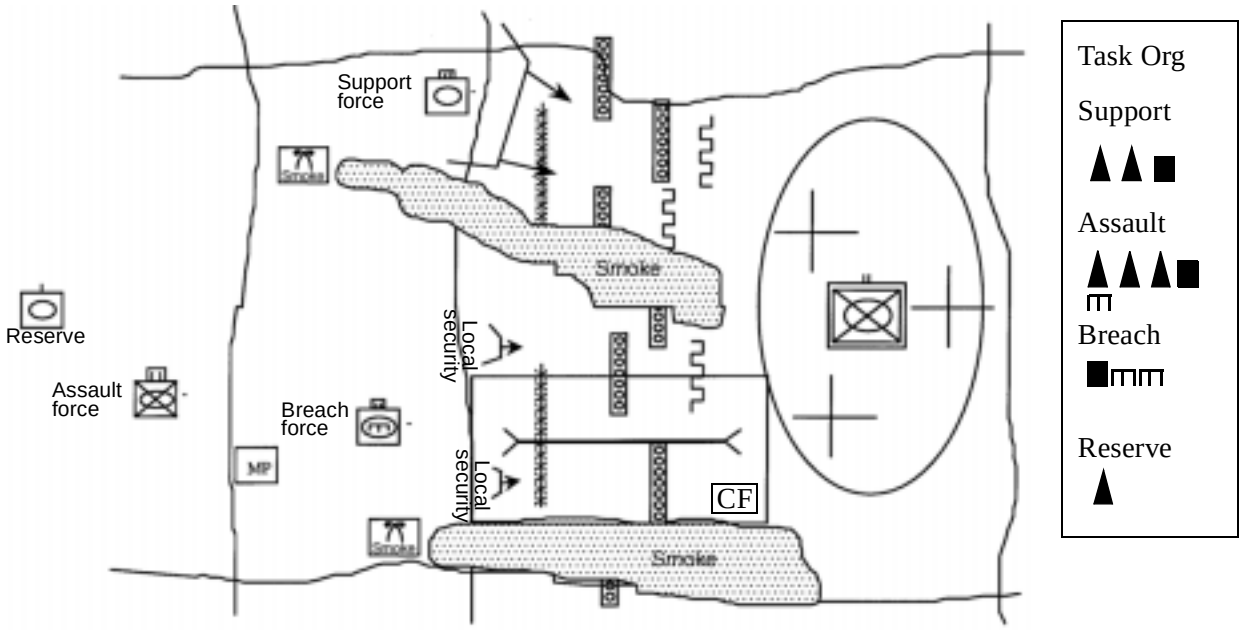


Figure 3-5. BDE Breach

once the assault force is passed and the enemy's direct-fire threat is eliminated.

- FS. Typically, the support force retains priority of fires during the breach. The support force's fire-support teams (FISTs) normally observe the enemy overwatching the obstacle and can call for fire support. The support force also controls requests for smoke emplaced by indirect-fire methods. On order, the breaching area should become a restricted fire area.

- Graphic control measures. Control measures that should be included on the brigade's consolidated graphics are—
  - Preplanned lane locations.
  - Coordination points (for assault-force linkup).
  - Passage points.
  - Battle handover line (BHL).
  - Coordinated fire lines (CFLs), restrictive fire areas (RFAs), and CFZs.
  - Objectives and ABF/SBF positions.
  - Phase lines (PLs) and unit boundaries.

- Casualty evacuation. Engineer battalions do not have the organic means to evacuate casualties. Casualty evacuation is coordinated on an area basis with the support or the assault force's aid stations. The breach force evacuates casualties to the aid station.
- Smoke assets. Smoke planning is critical. Everything must be war-gamed, from applying smoke to achieving the desired effects of smoke. Typically, a breach force may be allocated one mechanized smoke platoon. This asset may provide smoke to screen the breach force's approach to assault positions and the flanks of the forces performing reduction operations.

In *Figure 3-4, page 3-11,* the breach force moves from an attack position while a mechanized team leads in a wedge formation with two engineer companies abreast. The breach-force commander is positioned in the center where he can best C2 the formation. The breach force eventually occupies, an assault position and conducts final preparations for the breach while the support force sets, suppresses, and obscures the breach. On order, the breach force moves forward to reduce the obstacle system. A mechanized team occupies SBF positions to provide local security, and the smoke platoon continues to provide smoke at the breaching site. Engineer breach teams reduce and mark lanes and provide initial traffic control for assault forces passing through. After the assault forces pass, the MPs waiting in assault positions are called forward to assume traffic control. *Figure 3-5* depicts a brigade breach with the engineer task force as the breach force.

Once the brigade is able to establish footholds within its objective, committed TFs establish a hasty defense along PL Lion. The initial lane marking is upgraded to an intermediate marking pattern and the division is informed of lane locations. The lane network must be adequate for a brigade to pass through to secure the breachhead line. Lanes are further upgraded to handle two-way traffic and to allow a follow-on division attacking subsequent objectives to pass through.

While mobility is initially the priority effort, the brigade engineer also considers obstacle operations. He uses situational obstacles to assist in isolating the POP from reinforcements and CATKs and to provide supporting protection to the flanks during the attack. He also develops obstacle and survivability plans for a transition to the defense. Using the event template, the S3 and ABE estimate the time available for obstacle operations, to include transporting Class IV/V supplies to designated locations, emplacing obstacles, and integrating direct and indirect fires. See *Figure 3-6* for the engineer force laydown for a DATK.

Preparation. The success of a deliberate breaching operation depends heavily on the success of the R&S plan. The scheme of maneuver is based on known and templated intelligence. The brigade conducts an aggressive R&S plan with scouts, engineers, patrols, IEW assets, and aerial reconnaissance. NAIs are developed to confirm or deny the template. The brigade and engineer S2s continually refine the template based on hard intelligence. The task organization may be adjusted as more details on the defense and obstacle system are revealed. This information is also used during the combined arms rehearsals.

Through R&S, varied data and data sets, (such as meteorological, hydrographic, still and live imagery, and communications characteristics) can be collected on any given area of the earth's surface. The information products derived from these sources are of extreme value to the division commander and staff. The brigade engineer and his staff are key players in the production and products derived from national and strategic surveillance sources and the delivery of products and/or analysis which support R&S missions. Reconnaissance products and reports are used to confirm or deny critical assumptions made about the enemy situation and terrain

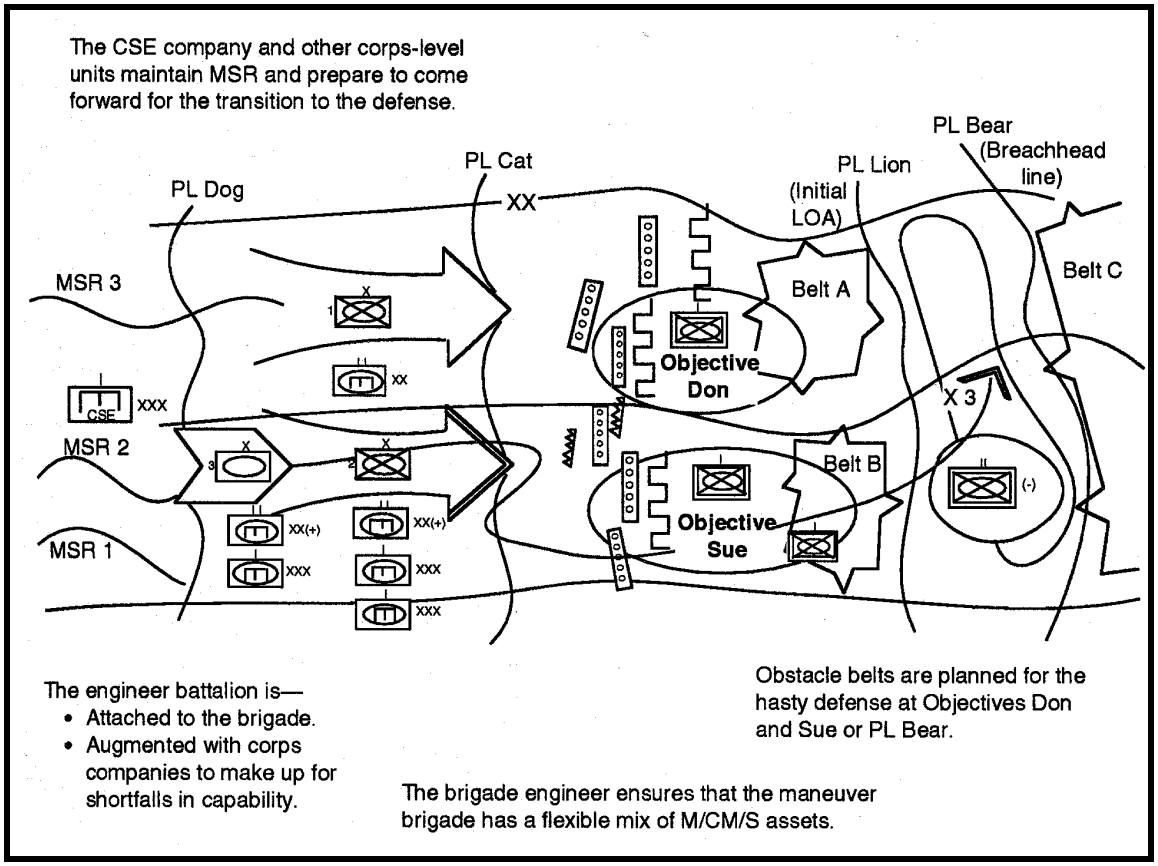


Figure 3-6. EAD force laydown for a DATK

in the division's battle space. Using intelligence feeds stored in the engineer ASAS-RWS database merged with data stored in the DTSS database, the brigade engineer will identify likely enemy mobility corridors and AA that threaten the brigade's flanks and rear. This information coupled with the results obtained through an aggressive and well-executed R&S plan will assist the brigade commander in visualizing the brigade's battle space and identifying the enemy's weakness or vulnerabilities that may be exploited.

The brigade plans, manages, and controls the rehearsals. Whether the brigade or a TF conducts the deliberate breach, key leaders supervise the breaching rehearsal. The rehearsal site reflects the actual obstacle system in as much detail as possible. Rehearsals include a leader-and-key-personnel walk through as well as individual rehearsals by support, breach, and assault forces. Commanders rehearse contingencies that include—

- Possible CATKs by templated enemy forces.
- Attacks by enemy indirect-fire systems.
- Situational obstacles.
- NBC weapons.

Execution. The brigade engineer directs the fight from the command group or lead TF or in a position forward as the breach-force commander. He positions himself where he can best observe, influence, and report the breaching operation. The staff engineer monitors the battle and conducts the normal C2 functions for combat operations. Synchronization is key to the success of deliberate breaching. The timing of artillery (suppression and obscuration) and other supporting fires and the timely movement

CHAPTER 4

Defensive Operations

The main purpose of a defense is to defeat the enemy's attack and gain the initiative for offensive operations. Brigades may perform a variety of missions in support of a division or corps defense. They may attack, defend, or delay across the full spectrum of the defensive framework as part of the security, main-battle-area (MBA), or reserve force. Brigades may also conduct offensive operations across the forward line of own troops (FLOT) while the majority of the division or corps defends, or they may serve as a ground tactical force in support of rear operations. Heavy brigades possess the combat power to conduct an offensively oriented maneuver defense. This could be a mobile defense or a combination of the mobile and area defensive patterns.

Brigade engineer forces provide a critical function in supporting the defense. Like offensive operations, the ultimate goal is integrating and synchronizing engineer operations with other BOSs. The maneuver and engineer commanders must understand the relationship between maneuver planning and obstacle integration. The brigade commander's intent for obstacle and survivability operations provides the impetus for directing the engineer effort. The engineer estimate process is the base planning tool for integrating into brigade defensive plans. While the process remains the same, each step is tailored to the needs of defensive planning.

NOTE: FXXI brigade's heavy reliance on enhanced digital communications systems, intelligence information, and sensors may shift the engineers' priority of effort. The FXXI battalion engineers' main survivability effort may shift to providing survivability of C^2 nodes and sensors from the survivability of direct and indirect fighting positions.

DEFENSIVE CHARACTERISTICS

The fundamental objective of the defense is to regain the tactical initiative through offensive action. With the advent of digital systems and sensors, the FXXI brigade commander and his staff should, through their enhanced SA and relevant common picture (RCP) of the battle space, be able to transition to offensive operations much quicker than an analog brigade. The commander and staff of the FXXI brigade, through the collection of real- or near real-time data, should be able to make continuous assessments of an enemy's strengths and weaknesses while gaining time for force buildup or to economize forces in one sector while massing forces for a surprise attack in another. Brigade defenses combine fires, tactical obstacles, and maneuver to destroy the enemy. To effectively support a defense, the engineer must understand the following characteristics of brigade defensive operations:

- Preparation.
- Security.
- Disruption.
- Mass and concentration.
- Flexibility.

PREPARATION

Defensive operations have a distinct preparation phase that is vital to the brigade's success. The brigade arrives at the battle area before the attacker, making the most thorough preparations that time allows. FXXI division engineers are structured with reduced conventional obstacle capabilities. They rely heavily on EAD engineer survivability assets. Regardless of the task organization, EAD engineer forces are a crucial resource that when properly planned and integrated support the engineer effort in the brigade AO.

Engineer success in the preparation phase depends largely on the ability of the brigade engineer to conduct integrated planning with the brigade staff and parallel planning with the staff engineers of both higher and subordinate units. The brigade engineer uses engineer channels to disseminate the information and intent needed to foster early planning at all levels.

Engineer participation in brigade preparations is not limited to the close operation in the MBA. The brigade engineer considers the full range of engineer requirements of the total defensive framework: deep, security, MBA, reserve, and rear operations. Each element of the defensive framework is considered during the mission analysis and accounted for in the brigade scheme of engineer operations.

NOTE: The FXXI brigade has a distinct advantage in the preparation phase for defensive operations over previous organizations. The brigade's ability to visualize the terrain, using its digital terrain data, and instantaneously coordinate the commanders' guidance is a major advance in reducing the time required to synchronize the defense. The brigade's extensive SA, down to the lowest level of command, combined with the speed and flexibility of the engineer-directed situational obstacles allows timely and accurate attack of enemy maneuver.

SECURITY

Defending forces provide security. Since the brigade defends to conserve combat power for use elsewhere, or at a later time, survivability operations are key in protecting the force. The brigade engineer advises the commander on the priorities based on the resources and the time available. He also considers security measures for engineer operations. Combat engineers are frequently exposed while installing tactical obstacles and constructing fighting positions. AD coverage and local protection are planned to protect engineer forces and material.

DISRUPTION

The brigade's defense includes a focused attempt to disrupt the enemy's tempo and synchronization by countering its initiative and preventing it from massing overwhelming combat power. The brigade engineer works closely with the brigade staff to ensure that engineer functions are integrated and synchronized. For example, the staff engineer participates in the target-value analysis (TVA) and recommends HVTs. The brigade staff further war-games the COAs to determine when, where, and how the HVTs are to be destroyed, neutralized, or suppressed. The brigade engineer focuses on the enemy as he develops his scheme of engineer operations. He attempts to deny the enemy a COA while at the same time supporting the main effort.

MASS AND CONCENTRATION

The brigade seeks to mass the effects of overwhelming combat power where it chooses and to shift that mass repeatedly according to its point of main effort. In the defense, the brigade's success depends on its ability to mass the effects of maneuver, direct and indirect fires, and tactical obstacles.

The brigade engineer identifies obstacle-control measures (such as belts and obstacle restricted areas) to focus countermobility effort in support of the maneuver's plan. In the FXXI brigade, digital systems enable the brigade commander to concentrate his forces' mobility to exploit or create an enemy weakness and subsequently mass his firepower through conduct of precision movement to attack the enemy from locations where it least expects it. Engineers employ tactical obstacles to support the scheme of maneuver and attack the enemy's ability to maneuver. Obstacle planning must support attacking the enemy's maneuver in a way that supports its destruction by CATK. Consequently, obstacle planning is more restrictive than permissive and reduces the brigade's flexibil-

ity. This serves to mass the obstacle effort at critical areas and preserves the counterattacking force's mobility in the MBA. *FM 90-7* provides the doctrinal base for conducting combined arms obstacle operations.

FLEXIBILITY

Defensive operations involve flexible planning and timely execution. Tactical flexibility stems from detailed planning, particularly in the IPB. The situation template is the focal point for planning CATK routes and the positioning of reserves. The brigade engineer coordinates and integrates engineer operations to support CATK plans. Obstacle-control measures are planned to anticipate CATKs and future operations.

Situational obstacles are further planned to add flexibility and depth to the defense. Through war gaming, the brigade staff synchronizes the use of situational obstacles. The brigade engineer focuses on enhancing the effects of repositioned fires (supplementary positions), separating enemy echelons, and protecting the flanks of counterattacking forces. For example, Raptor ICO provides the brigade commander an early warning capability and the ability to track the enemy and tactically interdict his movement. SCATMINEs delivered by artillery or aerial systems can be employed to the front, flanks, or rear of an advancing enemy force to disrupt its attack timetables.

BOS INTEGRATION AND SYNCHRONIZATION

In defensive operations, the battalion staff identifies critical tasks and events that must be war-gamed to determine when and

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IPB process, where to kill the enemy. For the brigade engineer, this is the most important factor in developing the engineer scheme of operations. Obstacle integration is a product of knowing where and how the commander wants to kill the enemy.

TACTICAL DEFENSE AND THE BRIGADE ENGINEER

Brigade commanders organize the battlefield for the defense by assigning sectors, battle positions (BPs), strongpoints, or a combination of all three to subordinate battalion TFs. Sectors, the least restrictive control measure, give battalion TFs the freedom to maneuver and decentralize fire planning. TF commanders have the liberty to position or maneuver units within their sector but must prevent penetration of their rear boundary. BPs are used when the brigade commander wishes to retain greater control over the maneuvering and positioning of his TFs.

A strongpoint is a heavily fortified BP tied to existing or reinforcing obstacles to create an anchor for the defense. It is located on a terrain feature that is critical to the defense or that must be denied to the enemy. A strongpoint can be used to fix, disrupt, turn, or stop the attacker. Extensive engineer support is required to successfully establish strongpoints.

PLANNING

The EBA and the IPB are the centerpieces of the defensive planning process. The IPB

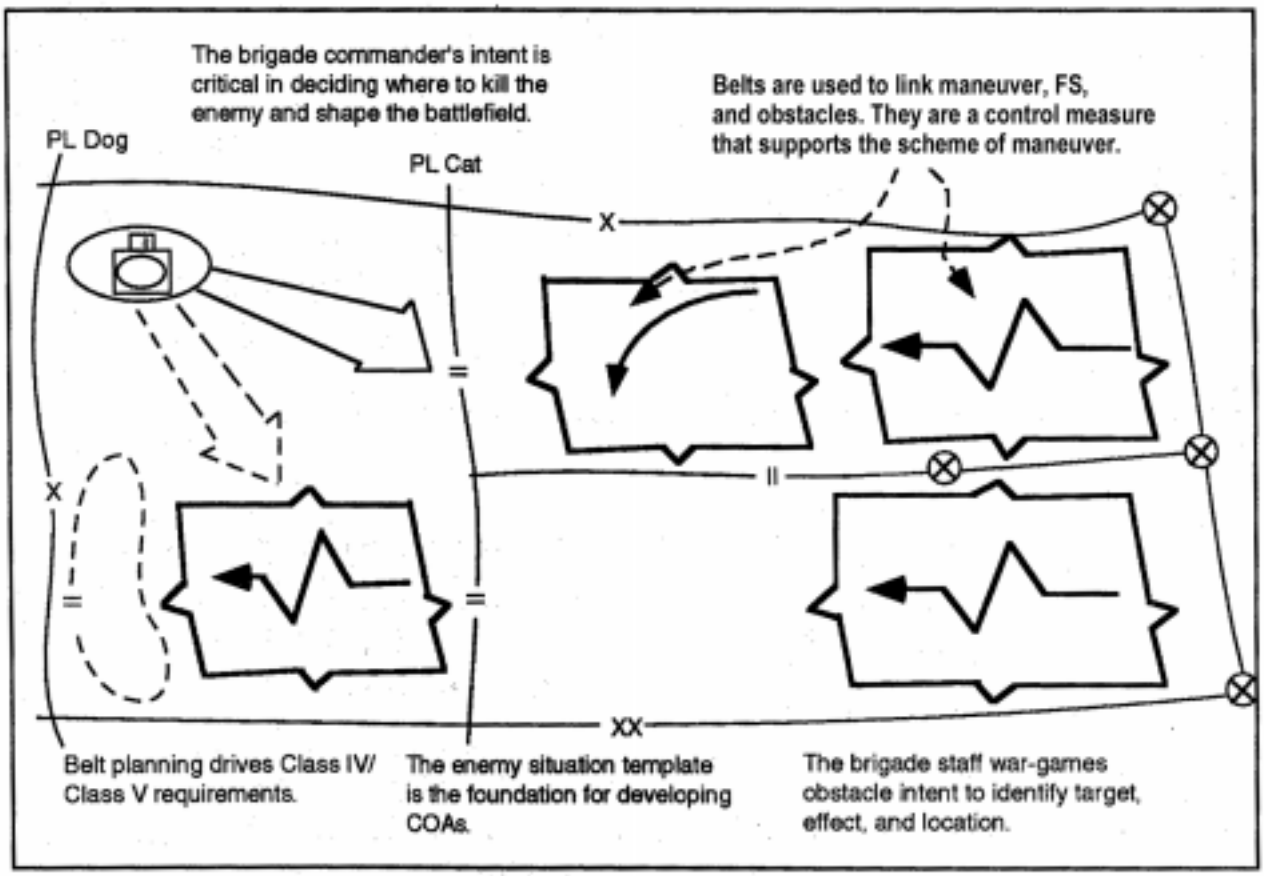

Figure 4-2. Mobile defense

process helps the commander to decide where to kill the enemy and to define the decisive point based on the terrain and enemy tactics and vulnerabilities. The challenge for a defending force is to strip away the enemy's initiative in order to create exploitable vulnerabilities. Much can be done through the gathering of information about the enemy and its vulnerabilities via human intelligence (HUMINT), signal intelligence (SIGINT), and imagery intelligence (IMINT) resources. These systems enable the commander to gain information dominance, influence the enemy commander's decision cycle, and enhance survivability. The highly lethal FXXI brigade, with its long-range-attack resources, has multiple means of stripping the enemy's initiative. The ability to locate and track the enemy, strike deep, conduct precision maneuver, and selectively attack the enemy from locations where it least expects attack all serve to stifle an enemy's initiative.

At the maneuver level, the enemy's initiative is stripped by further disrupting its movement timetables through the effective integration of combined arms indirect and direct fires with obstacles. Therefore, the brigade engineer will direct and oversee the development of a brigade obstacle plan designed to support defensive operations. This plan is a comprehensive, coordinated plan that integrates the use of tactical and protective obstacles to support the brigade commander's scheme of maneuver and maximum use of offensive tactics. The plan will designate obstacle responsibilities, general obstacle locations, directed/reserve obstacles, and special instructions. The plan is normally a prepared annex to the brigade's digital OPLAN or OPORD. The plan may include control measures (for example, obstacle belts, zones, and groups), obstacle intent and priority, and restrictions. The obstacle planning process provides the foundation for integration into the brigade's overall defensive plan. Integration itself is generally a bottom-up driven process. Control, intent, and resourcing are top-down driven processes. The engineer S2, the S3, or the ABE assists the brigade S2 in developing the MCOO and the situation template. The staff incorporates DTSS, MCS-ENG, and TerraBase II products into this process.

EBA development begins once the brigade receives the mission. The information that is gathered is used to—

- Develop doctrinal and situation templates (threat engineer order of battle and mobility and countermobility capabilities).
- Recommend IR/PIR.
- Recommend HVTs (mechanical breaching assets).
- War-game and synchronize the defensive plan.
- Identify NAIs/TAIs/decision points.
- Develop the engineer estimate and time line.
- Support TF planning with terrain and digital products.

The engineer estimate and time line must be continuously refined. Obstacle and survivability estimates are based on a not later than (NLT) time. However, a plan should be created for use of additional time if it becomes available.

The engineer considers the following questions as he conducts the war game and develops the engineer scheme:

- What can the engineer force accomplish in a given period of time?
- Is our estimate based on standard planning factors or METT-T?
- Can our soldiers exceed the standard, or are they inexperienced?
- What is the withdrawal criteria for engineer forces forward?

Other planning considerations include—

- Task organization.
- Obstacle-control measures (such as belts and restricted areas).

- Class IV/Class V supply allocation and distribution.
- Mobility requirements for security forces and sustainment operations (location of lanes).
- Priorities for survivability.
- Directed, reserve, and situational obstacle employment.
- Deception operations (displays).
- SCATMINE planning (such as artillery, Volcano, Gator, and a modular pack mine system (MOPMS)).

METT-T dictates task organization. In the defense, the brigade engineer normally weighs the option between general support (GS) or DS. He determines the advantage of massing his battalion versus task organizing his companies to TFs. Special consideration must include the impact on the CSS organization. Survivability operations might be best controlled and maintained by massing the blade effort at battalion level. This centralized operation provides a more responsive fix capability and allows the battalion to concentrate its maintenance effort forward.

The brigade scheme of maneuver influences obstacle-control planning. Brigade commanders use obstacle belts and/or obstacle restricted areas to focus countermobility effort and maneuver. The commander's intent for where and how to kill the enemy is crucial for obstacle integration.

Belts must be positioned inside obstacle zones or approved by the division. The obstacle-belt effect (disrupt, fix, turn, and block) specifies to TF commanders what impact the scheme of maneuver and tactical obstacles must have on the enemy force.

The war-gaming process synchronizes the effects of fires and tactical obstacles throughout the depth of the battlefield. The engineer S3, maneuver S3, and FSO confirm—

- Trigger lines.
- Target reference points.
- EAs.
- Engagement criteria/fire distribution.
- Contact points.
- Obstacle integration.
- Situational-obstacle execution.

PREPARATION

The brigade engineer and staff monitor defensive preparations, revise the time line, and keep the commander informed of any changes. TF plans and overlays are checked to ensure that EAs are properly developed and that the commander's intent is achieved. Execution matrices should reflect a clear synchronization between the obstacle effect and fires.

There is no substitute for a thorough ground reconnaissance to confirm the defensive plan. Obstacle-siting procedures confirm the linkage between fire control and obstacle effect.

Finally, the brigade engineer uses the brigade synchronization matrix as a tool for leading him through the brigade rehearsal. He will focus on BOS synchronization and obstacle integration. He ensures that commanders understand the current status of M/CM/S operations.

EXECUTION

The brigade engineer and staff continue to monitor the operation. The staff engineer—

- Tracks the DST/synchronization matrix.
- Tracks the battlefield.
- Triggers lane closures.
- Repositions engineer assets.
- Executes situational obstacles.

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CHAPTER 5

Other Tactical Operations

Other tactical operations encompass a wide range of special-purpose operations undertaken routinely during offensive and defensive operations. While not the main focus, these operations must be integrated and synchronized.

LINKUP

Linkup operations are conducted to join two friendly forces. They are also conducted to—

- Complete the encirclement of an enemy force.
- Assist the breakout of an encircled force.
- Join an attacking force with a force operating in the enemy's rear.

Regardless of the purpose of the linkup, in execution, the operation takes one of the following forms:

- Linkup of a moving force with a stationary force.
- Linkup of two moving forces.

PLANNING

Early coordination of digital graphics with the stationary force will confirm intelligence and obstacle status. The linkup engineer force focuses on mobility operations. The brigade engineer also plans for subsequent missions and task-organizes accordingly. As in all offensive operations, provisions are made to position Class IV/V supplies for a transition to the defense. Priorities are established for survivability if the brigade conducts a hasty defense.

PREPARATION

The brigade engineer confirms linkup and passage points (digital locations and markings). He ensures that his forces are task-organized and prepared for the operation. Special emphasis is placed on ensuring that the stationary force's obstacle overlay is posted and that lanes/passage points are annotated.

NOTE: In the FXXI division, much of the planning information can be shared between digital systems using free-text messaging accompanied by digital overlays that graphically display the control measures for linkup operations. In brigade and below units of the FXXI division, linkup operations are enhanced through the use of FBCB2 and the Battlefield Combat Identification System (BCIS) that facilitates the identification from friend to foe.

EXECUTION

Once the linkup occurs, engineer companies must be prepared to react to changes in the task organization (situation dependent). Depending on the subsequent mission and/or the enemy situation, the brigade engineer recommends changes to the commander.

RELIEF IN PLACE

A relief in place is an operation in which a unit is replaced in combat by another unit. The incoming unit assumes the replaced unit's responsibilities for the combat mission and the assigned zone of action. A relief may be conducted during—

- Offensive or defensive operations.
- Various combat operations and OOTW.
- All types of weather and light conditions.

The primary purpose for a relief is to maintain the combat effectiveness of

committed elements. If possible, it should be conducted during limited visibility to reduce the chance of detection.

PLANNING

Similar to a linkup, units coordinate information on OBSTINTEL and other engineer-related intelligence. Digitization can enhance a unit's ability to accomplish a relief. Automated overlays depicting current friendly graphics, current obstacle information, preplanned FS measures, and the latest enemy situation update can be passed before the relieving force makes contact with the in-place force. The brigade engineer becomes familiar with the existing defensive plan and considers making adjustments based on the subsequent mission. He conducts a reconnaissance of the area to confirm the location, status, and integration of tactical obstacles.

PREPARATION

Intelligence and obstacle overlays are posted and disseminated. Further coordination is conducted to confirm the defensive plan, obstacle handover, and subsequent missions. Route clearance and marking is also coordinated to facilitate movement along designated routes.

EXECUTION

The incoming and outgoing engineer commanders link up and monitor the handover of reserve targets and overlays, verifying the status of tactical obstacles. It is important that the lanes through minefields or other obstacles are confirmed to facilitate the passage of reconnaissance forces.

BATTLE HANDOVER AND PASSAGE OF LINES

A battle handover is a coordinated operation between two units in the close-in battle, which transfers the responsibility for fighting an enemy force from one unit to another. It is designed to sustain the continuity of the combined arms fight and protect the combat potential of both forces involved. Battle handover may occur during offensive or defensive operations. It is usually associated with conducting a passage of lines.

A passage of lines is an operation in which one unit passes through the positions of another. An example is when elements of a covering force withdraw through the forward edge of the MBA (rearward) or when an exploitation force moves through the elements that conducted the initial attack (forward).

PLANNING

Mobility and terrain management are major concerns during a battle handover or a passage of lines. The passing engineer coordinates with the stationary brigade engineer concerning the following:

- Threat engineer intelligence.
- Location and status of tactical obstacles.
- Location of lanes and bypasses.

The location of friendly obstacles should influence the selection of passage lanes. Some obstacles may have to be reduced to facilitate the movement along designated routes. In this regard, coordination for opening and closing lanes must be made at the contact points. Further planning is required to support the follow-on mission.

NOTE: TTP must be developed to address the manner in which control and coordination is effected with engineer units that are not FBCB2- equipped but provide support to brigade and below maneuver elements.

PREPARATION

The brigade engineer ensures that commanders understand the location and description of friendly obstacles along the passage lane. At the rehearsal, he covers

ENGINEER BATTALION TF

The division engineer battalion may be task-organized to operate independently or with additional engineer or combat/CS elements to meet a variety of mission requirements, to include—

- Offensive operations. The engineer battalion may be organized as the breach force for a brigade deliberate breach or as a mobile obstacle detachment to provide flank security.
- Defensive operations. The engineer battalion may be organized to conduct countermobility and survivability operations in support of a brigade or division EA.
- OOTW. The engineer battalion may be organized to construct refugee camps and EPW compounds, conduct humanitarian missions, destroy enemy equipment, clear areas of unexploded ordnance, develop/mark combat roads and trails, and initially construct base camps in support of follow-on United Nations or coalition forces.

For any of these missions, the engineer battalion may have the following attached/ OPCON to it:

- Infantry or armor platoon or company teams.
- Corps-level engineer assets (to include national guard or reserve elements).
- MPs.
- Explosive ordnance disposal (EOD) elements.
- AD assets.
- FISTs (to include combat observation lazing teams (COLTs)).
- Chemical smoke-generator platoons.

The engineer commander and staff must have a working familiarity with the capabilities of each asset. It is also essential to have predrawn SOPs, checklists, and plans so these assets can be rapidly integrated into the scheme of maneuver/concept of the operation.

Organizing an engineer TF, particularly for combat missions, frequently requires units to plan and prepare with minimal time available. Major challenges include assembling the TF, issuing orders, and conducting rehearsals. Planning considerations include—

- Assembling the force. As soon as the brigade commander decides to form an engineer TF, the engineer S3 coordinates with the brigade S3 to locate terrain that is suitable for an assembly area. The engineer battalion CSM is sent to that location to conduct quartering operations and assign sectors to subordinate elements. The assembly-area location is disseminated in the brigade WO or OPORD. The brigade WO and OPORD direct the task organization and linkup times at the assembly area. Unit first sergeants (1SGs) or noncommissioned officers in charge (NCOICs) are sent to that location with their quartering parties to coordinate with the engineer CSM.
- LOs/NCOs. Once the order is received, LOs are dispatched to the engineer main CP. The LOs provide information on the current status of their respective units, unique or critical supply requirements, and the closure times of their units into the assembly area. The LOs participate in the planning process, ensuring their operating system or function is properly integrated and/or synchronized.
- Communications. Communications must be worked out early in the planning process. Units may not have the latest in FM and digital equipment (such as frequency hopping, single-channel, ground-to-air radio systems (SINCGARSs) or MSE. Some elements may not have secure FM communica-

tions capability. A communications plan must be developed which allows all elements to remain in contact throughout the operation.

- Night-vision capability. If operations are to be conducted during hours of darkness, it is essential that all elements have appropriate night-vision capability.
- Command relationships. The normal command relationship is OPCON with the parent unit providing logistics support.
- Logistics. Although logistics responsibility may rest with the parent unit, the engineer TF rear CP must be aware of the logistics status of each subordinate element and ensure that coordination is made to meet their requirements. Specific considerations include—
  - Ammunition. Resupply for tanks, Bradleys, and TOWs must be coordinated. Additionally, the types and amount of small arms that a unit uses must be determined.
  - Fuel. The type of fuel that a unit uses must be determined. Some units from echelons above division may have equipment which uses motor gasoline (MOGAS) or diesel. These types of fuel are not readily available in a division which predominately uses JP-8. Smoke generators require a steady supply of fog oil.
  - Repair parts and maintenance support. Normally, the engineer battalion establishes separate combat trains to meet these requirements (see *Chapter 6).*
  - Casualty collection and treatment. The engineer battalion does not have an organic aid station. Support must be arranged for direct evacuation to the field hospital in the BSA or on an area basis with another TF's aid station.
- TLP. WOs are issued as soon as possible. Leaders conduct PCIs of their units. The battalion order includes specific missions for subordinate units and a detailed execution matrix defining when and where units must execute critical tasks, Key leaders conduct rehearsals and back briefs to ensure that all leaders understand the plan.
- C2. Engineer TFs require a dedicated C2 facility. Consequently, if the engineer main CP and/or tactical CP are located with their brigade counterparts, one or both may need to be detached to act as the TF CP.

ENGINEER COMPANY SEPARATE FROM THE ENGINEER BATTALION

There are circumstances that cause the time to a deploying maneuver TF or brigade engineer to attach one or more another engineer battalion (light or companies for an extended period of heavy).

PLANNING

The company is supported with a service-support slice from the engineer support element in the FSB. The normal command relationship is attached. This slice may include all or some of the following assets:

- Maintenance.
  - One NCOIC.
  - Six mechanics.
  - One prescribed load list (PLL) clerk.
  - One M88.
  - One contact truck.
  - One unit-level logistics- system (ULLS) computer.
- Petroleum, oils, and lubricants (POL).
  - One fuel handler.
  - One heavy expanded mobility tactical truck (HEMTT), fuel.
- Medical (two medics).
- Mess.
  - One NCOIC.
  - Three cooks.

- One vehicle with a mobile kitchen trailer (MKT) or one kitchen, company-level field feeding (KCLFF).

PREPARATION

For extended operations, the company is normally attached to the supported TF. The TF commander has to fully integrate the engineer company into all planning sessions, rehearsals, and administrative actions. In preparation for the detachment, the brigade engineer should ensure that the gaining TF commander understands the capabilities, limitations, and requirements associated with gaining an engineer company. The brigade engineer and the TF commander coordinate the linkup point and time and the size of force (personnel and equipment) being transferred.

EXECUTION

The detached company maintains communications with the engineer battalion. It reports equipment, personnel, and mission status according to unit SOPs. Although the brigade engineer has no tasking or command authority over the detached company, he must anticipate reattachment and be prepared to refit/rearm the company, as needed.

HEAVY/LIGHT

The primary concern in heavy/light operations is integrating the two forces and understanding their capabilities and limitations. For the brigade engineer, he must be familiar with the light engineer organization. In most cases, the light, air-assault, and airborne TFs have a light engineer platoon attached to them. The following are planning considerations for offensive and defensive operations:

- Breaching capability (assault and covert breaching are light-force norms).
- Lane-marking scheme.
- Vehicle haul capacity (none in the light platoon).
- Individual load-carrying capability (Class V supplies).
- Employment/C2 of Volcanoes.
- Class IV/Class V resupply (pre-positioning)
- Transporters for obstacle operations.
- Survivability (two to four SEEs) an countermobility estimates (capabilities).

The primary weapon of the light infantry battalion is the M16 assault rifle. In addition, the battalion also has the following:

- Sixty-five M203 grenade launchers.
- Eighteen M60 machine guns.
- Eighteen dragons.
- Four TOW AT missiles.
- Four 81-millimeter mortars.
- Six 60-millimeter mortars.

The light engineer is equipped much like his light infantry counterpart. He is well versed in light infantry tactics and is a part of the combat formation.

LIGHT TF ATTACHED TO A HEAVY BATTALION

One aspect of heavy/light operations is a light TF attached to a heavy brigade. The brigade engineer can expect a light engineer platoon (at a minimum) to support the light TF.

Planning

Once notified of the task organization, the brigade engineer has his staff initiate actions to accept the light engineer platoon into the battalion. These actions include determining the—

- Status of equipment and personnel.
- Requirements for maintenance support.
- Requirement for augmenting the platoon with heavy assets.

The light TF normally provides CSS support to the light engineer platoon. This may solve any maintenance or special Class V problems.

Preparation

In many cases, the light TF has an infiltration/covert-breach mission as part of the brigade plan. The brigade engineer must fully understand the light engineer platoon's mission to ensure success. The key part of knowing the mission is the rehearsal. The brigade engineer should include the light engineer platoon in his battalion OPORD, to include back briefs with his engineer company commanders.

Execution

As a part of the light TF's infiltration/ covert-breach mission, the light engineer platoon can provide obstacle intelligence. The key to success is communications between the light engineer platoon and the brigade engineer (main CP or tactical CP). This allows for timely and accurate reporting and further allows the brigade engineer to see the battlefield and make timely recommendations to the brigade commander. If the light engineer platoon is tasked with breaching a lane for heavy forces, the lane marking must be understood and should be according to the unit SOP. The brigade engineer must consider marking material for the light engineer platoon which is not cumbersome to carry and is easy to install. Light engineer platoons normally mark the initial lane-marking pattern.

HEAVY BRIGADE ATTACHED TO A LIGHT DIVISION

The other aspect of heavy/light operations is the heavy brigade attached to the light division. The brigade engineer has at his disposal more engineer assets and capability than the light DIVEN. The brigade engineer can anticipate to have one or more engineer companies task-organized to a light brigade within the division.

Planning

The brigade engineer must quickly integrate into the light engineer's planning cycle. This is normally conducted by either going to the DIVEN HQ or sending a representative to conduct initial coordination. To integrate the heavy engineer within the framework of supporting a light division, consider the following:

- Advising the DIVEN on the-
  - Best routes for maneuvering the armored brigade.
  - Areas that would be best defended by heavy forces.
- Task-organizing one or more engineer companies to other light brigades.
- Accepting one or more light or corps engineer units into the brigade.
- Identifying supply requirements and their impact on mission accomplishment. An accurate logistics estimate is always helpful in anticipating logistical shortfalls.

Preparation

As with any operation, the rehearsal is the key to success. The brigade engineer may have to deal with a variety of engineer units (heavy, corps, and light) within his AO. A detailed engineer rehearsal before the brigade rehearsal helps resolve any conflicts that may arise. The brigade engineer must rely on his subordinate commanders to ensure that PCIs are conducted and that units are combat ready.

Execution

The capabilities of each engineer unit vary. The mechanized engineer should provide support to an armored force, The light engineer can provide invaluable obstacle intelligence to the brigade engineer. In addition, the light engineer can prebreach/identify lanes for the armored force. The mechanized engineer battalion main CP is the collection point for all engineer information on the battlefield. The engineer commander and his staff refine the information and advise the brigade commander on the engineer effort as it develops. In the defense, the brigade engineer should task all available SEEs to dig in the light forces. If D7 dozers from the corps engineers are provided, they should be used to construct survivability positions and assist the M9 ACE in constructing hasty positions. This saves wear and tear on the M9 ACE and further saves it for offensive operations.

CHAPTER 6

Combat Service Support

CSS elements arm, fuel, fix, move, man, sustain, and provide combat health support (CHS) for the engineer battalion so it can accomplish its mission. The battalion commander plans his tactical and CSS operations concurrently. He ensures that his scheme of engineer operations is logistically supportable. CSS is received from the BSC of the FSB, located in the BSA. The mission of the BSC is to provide direct and habitual CSS to a heavy brigade, area support to divisional units attached to the brigade, and DS to FSCs. *Figure 6-1* shows the BSC organization.

Within the BSC is a ESE that consists of fuel, food service distribution, and maintenance repair teams dedicated to support the companies within an engineer battalion. To facilitate consolidated CSS, support a flexible and agile task organization, and establish a control measure for corps engineers with the BCT, an ESA is established forward of the BSA. This ESA may or may not be part of a

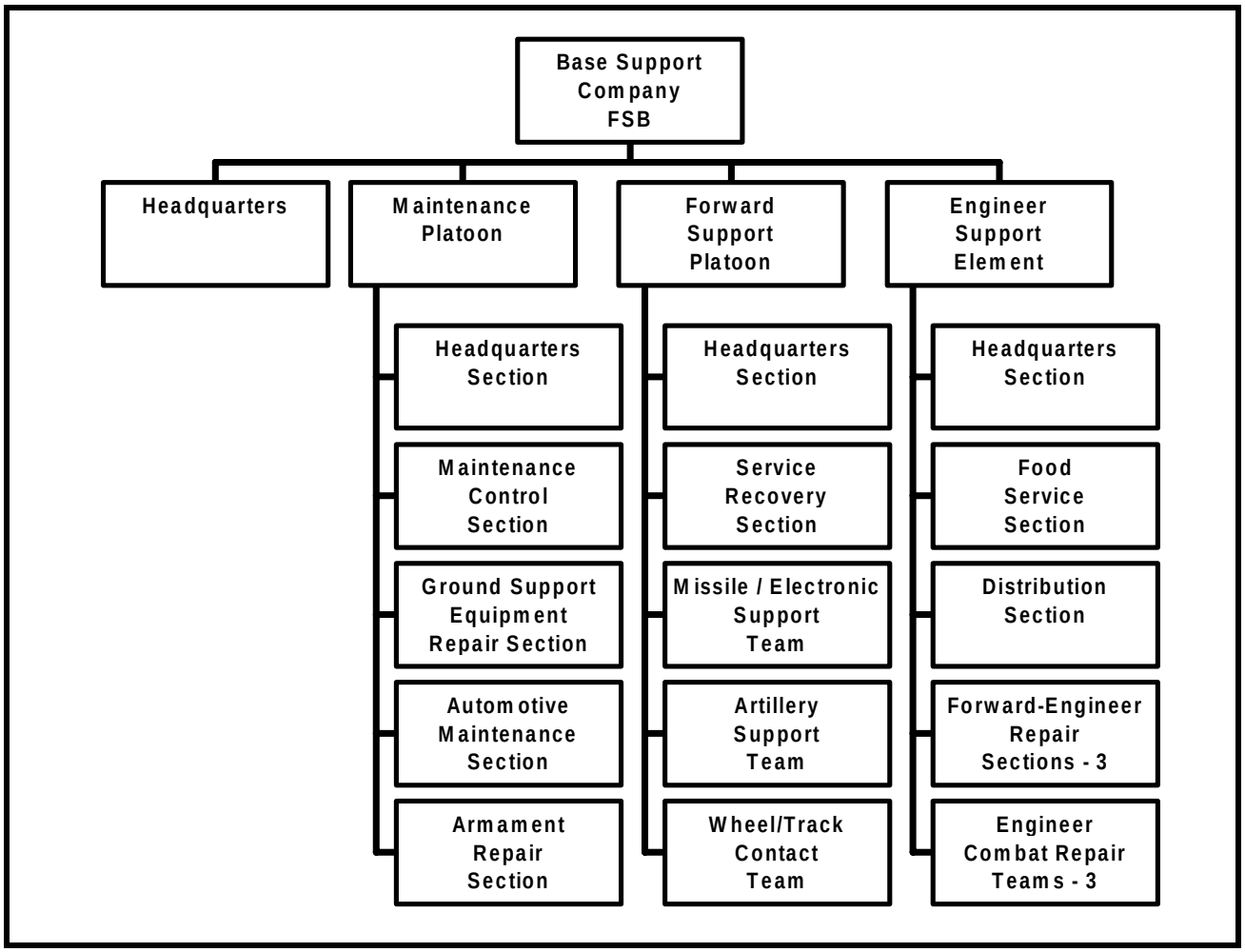


Figure 6-1. Brigade support company organizational chart

wider BFSA, dependent upon the allocation of EAD engineer forces (*see Figure 6-2, page 6-4*).

The ESA is headquartered by the engineer battalion ALOC and engineer battalion HHC. The ESA is an area from which corps engineers (combat mech, wheel, CSE, bridge, combat heavy, and such) stage operations and where their supporting maintenance teams (organic and DS) reside; the same applies to EOD and any other units which are part of the "engineer force" task organization. The ESA will include a distribution node for corps throughput for use by corps engineers and possibly the DIVEN. The ESA will include a multiunit UMCP to maintain all vehicles, division and corps, in the engineer force task organization. This ESA may or may not be part of a wider BFSA, dependent upon the allocation of EAD engineer forces. Located in the BSA may be the engineer battalion ALOC (-) with responsibilities as an engineer logisitical liaison center and brigade rear engineer duties, METT-TC dependent.

The ESE from the FSB will include a C^2 cell and an HHC maintenance section which will reside with the ALOC in the ESA. The ESE will "zip into" the ALOC to form a multifunctional, support-oriented CP (just like various units zip into a tank battalion TOC to form a multifunctional TF TOC).

The ESE has three combat repair teams (CRTs) consisting of about 8 mechanics, a contact truck, an APC, a 5-ton truck, and an M88. Each CRT will always be collocated with the engineer company to provide it immediate, forward repairs; the CRT will "work for" the engineer company 1SG, although its higher headquarters is the ESE.

When an engineer company remains task organized to its parent engineer battalion, or when it is OPCON, DS, or GS to a maneuver task force, its supporting CSS team (fuel, transportation, mess, and maintenance) will operate out of the ESA under the ESE. Calls for support will be passed from points in the engineer company, through the company 1SG, to the battalion S4, to the ESE. This does not prevent engineer companies from using maneuver UMCPs or other CSS assets to obtain immediate, good-neighbor support. The brigade OPORD may also dictate certain deviations in CSS (for example, TF 1-2 will provide fuel support to A/99 Engr). The engineer company supply sergeant will locate in the ESA.

When an engineer company is **attached** to a maneuver task force, a multifunctional CSS team (CRT plus other maintenance, PLL, transportation, fuel, and mess) will be packaged and task organized to that maneuver TF's FSC. Calls for support will then be routed to the TF S4, not the engineer battalion S4. Engineer vehicles will be repaired in the TF UMCP. The engineer company supply sergeant will locate in the supported unit's task force support area (TFSA).

Organic medics in the engineer battalion HHC and combat lifesavers provide CHS within the various engineer platoons. This frees company commanders to concentrate on the tactical mission.

CSS PLANNING

If CSS planners identify constraints, the commander must evaluate the risks and, if necessary, establish new priorities or modify his tactical plan to eliminate or reduce their effects. The personal involvement and on-the-scene appraisal of the situation by CSS personnel are as important to mission accomplishment as is the personal involvement of combat leaders. CSS planners must—

- Understand the commander's intent and priorities.
- Track/monitor the battle.
- Anticipate requirements and use initiative to meet them.
- Pre-position supplies and equipment.
- Actively push support forward.

- Use established routines during lulls in the battle to rearm, refuel, and repair.

The organization and procedures employed depend on the combat mission and the capabilities of the CSS organization. The brigade task organization determines how the FSB organizes, coordinates, and executes CSS operations. For example, an engineer battalion attached to a maneuver brigade requires the FSB to conduct all CSS operations for the engineer battalion. An engineer company placed in DS to a battalion TF requires the engineer battalion to consider the company's limitations and coordinate with the FSB support operations to ensure all CSS requirements are met. The command and support relationship becomes even more critical to CSS planning in determining where units will receive their CSS, due to recent logistics force structure changes within the engineer community.

CSS PERSONNEL

The battalion commander works primarily with his XO, S4, S1, HHC commander, CSM, and FSB staff to anticipate and plan requirements for CSS and to assist in the employment of support assets to ensure mission accomplishment. The XO directs staff coordination from the main CP. He is assisted by the—

- S4.
- S1.
- HHC commander.
- Engineer support platoon leader.
- CSM.

The engineer battalion commander must concentrate on maneuvering with his brigade combat team (BCT) to accomplish the tactical mission. The CSS mission of sustaining the engineer battalion's personnel and equipment throughout operations is more critical to success on the FXXI battle space than ever before.

SUPPLY

The S4 is the focal point of logistics planning in the battalion. He—

- Coordinates with FSB support operations section to ensure the engineer battalion receives the CSS required to accomplish its mission.
- Serves as the OIC of the battalion's ALOC (-), located in the BSA, if applicable.
- Serves as the primary staff officer in the areas of supply, transportation, and field services.
- Focuses on future operations and anticipates requirements.
- Supervises the S4 section with help from the battalion supply sergeant.
- Directs the companies supply sergeants in the formation of the logistical packages (LOGPACs).

ADJUTANT

The S1 is the primary administrative and personnel planner. The personnel and administrative center (PAC) supervisor and the personnel staff noncommissioned officer (PSNCO) assist the S1 with his duties. His key focus is on manning the battalion. He—

- Performs personnel service-support functions.
- Performs strength accounting, replacement operations, and casualty reporting.

HHC COMMANDER

The HHC commander makes decisions concerning CSS operations in the absence of the battalion XO. He—

- Serves as the OIC of the battalion's ALOC located in the ESA.
- Coordinates support for the battalion in the BSA.
- Acts as the LO to the FSB/brigade ALOC and the engineer battalion ALOCs.
- Coordinates the flow of information between the engineer battalion TOC and engineer battalion ALOC through communications with the S4.

COMMAND SERGEANT MAJOR

The CSM assists in the CSS effort by troubleshooting the system and providing information on the current logistics situation.

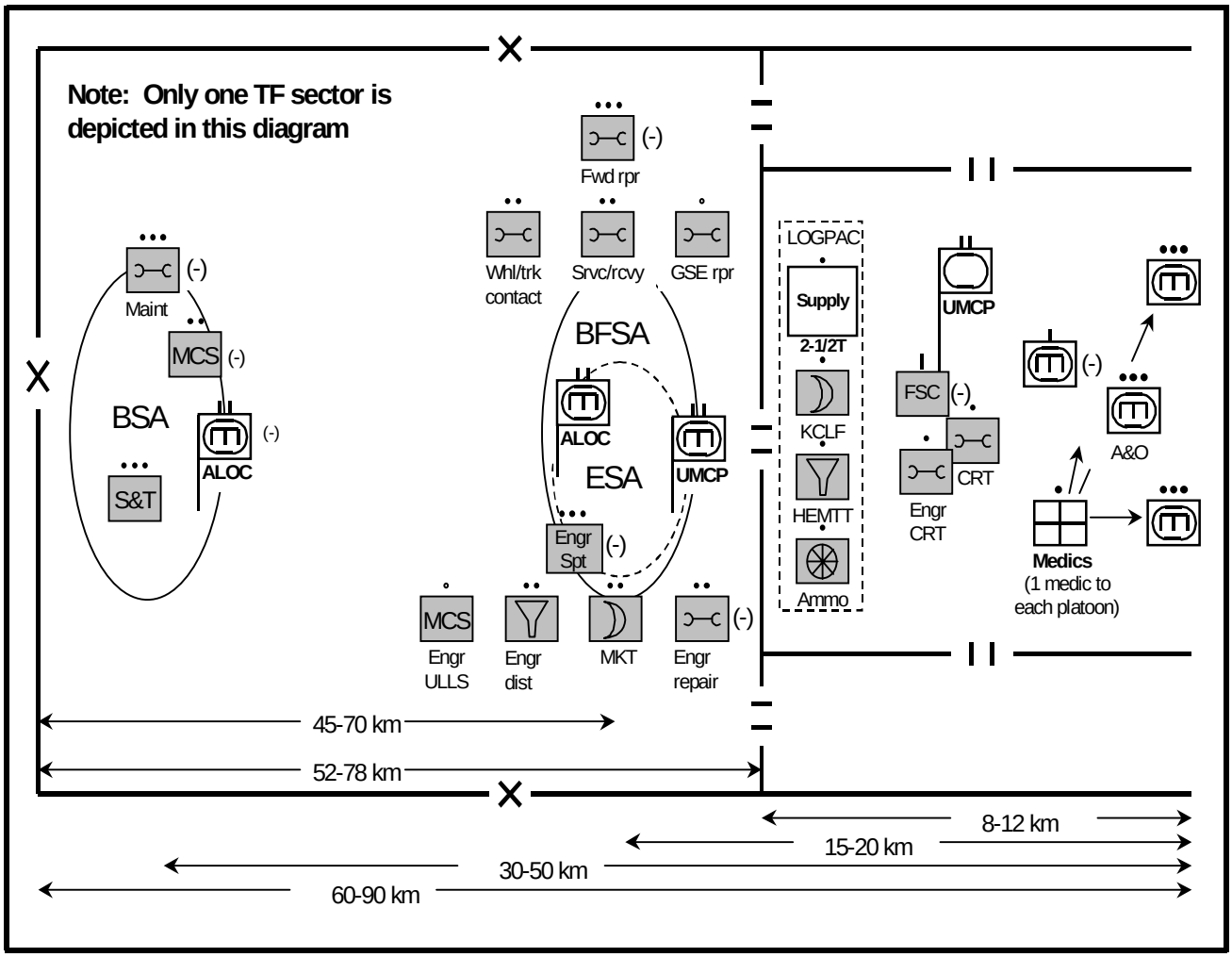


Figure 6-2. Brigade support area (engineer sustainment)

CSS ORGANIZATIONS

The organic and supporting units execute battalion CSS missions. The administrative ALOC coordinates the functions of these units. The communications, medical, S1, and S4 sections are organic to the battalion. The FSB and other CSS assets supporting the BCT provide additional CSS.

S1 SECTION

The S1 section is located in the ESA at the engineer battalion ALOC. It—

- Performs the general administration of the battalion.
- Performs the critical tasks of strength accounting, replacement operations, and casualty reporting.
- Performs personnel actions and services (legal, administrative, and financial).
- Performs EPW operations and medical planning.
- Coordinates with the S2 for interrogation of prisoners and the S4 for the processing of captured equipment and transportation requirements for EPWs.
- Coordinates with the medical-section leader to ensure that patient treatment

and evacuation are planned and coordinated throughout the battalion.

MEDICAL SECTION

The medical section provides unit-level medical support to the line companies. It has definite limitations and requires augmentation to adequately treat and evacuate the sick and injured.

S4 SECTION

The S4 section is located in the ESA at the engineer battalion ALOC. It—

- Requests and distributes supplies to company supply sections.
- Turns in captured supplies and equipment, as directed.
- Performs transportation and field service functions.

BSC MISSION, FUNCTIONS, AND ORGANIZATION

The mission of the BSC is to provide direct and habitual CSS to a heavy brigade, area support to divisional units attached to the brigade, and DS to FSCs. The BSC provides unit maintenance for itself, the brigade HHC, the FSB, the brigade recon troop, and the engineer battalion. The BSC provides DS maintenance for itself, the brigade HHC, the brigade recon troop, an engineer battalion, and a field artillery battalion. It does not provide unit maintenance for the field artillery battalion.

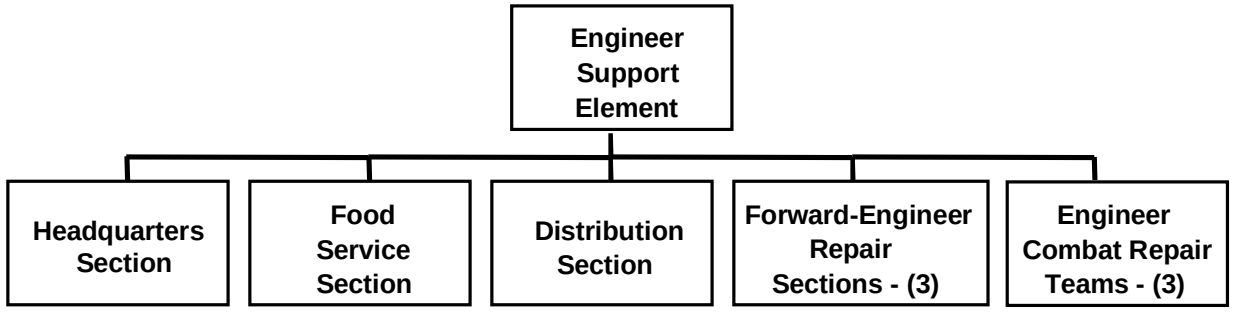
BSC ORGANIZATION

Figure 6-1, page 6-1, shows the BSC organization. Since the BSC is responsible for the majority of engineer CSS, it is discussed below in detail. BSC capabilities include—

- Providing C^2 for organic and attached CSS personnel.
- Executing the support requirements for a maneuver brigade and attached units.
- Receiving, storing, issuing, and transloading supplies.
- Maintaining ASL/combat spares to include receipt, storage, issue, retrograde, and exchange. ASL includes Classes II, II(P), IV, and IX supplies (less aviation.)
- Providing Class II bulk and retail fuel support for a heavy brigade, attached units, and organic equipment.
- Providing ration issue for a maneuver brigade, attached units, and organic personnel.
- Providing water storage and limited distribution for the brigade. Distribution is limited to FSCs.
- Providing organizational and DS maintenance for a maneuver brigade (-) and dedicated DS to a field artillery battalion, and providing limited back-up DS maintenance to a FSC. All repairs/levels of repairs are based on the availability of tools, time, test equipment, repair parts, and METT-TC.
- Maintaining SA through the Automated Information Management System (AIMS).

ENGINEERS SUPPORT ELEMENT

The multifunctional engineer support element (ESE) operates on a centralized CSS concept, providing all classes of supply, food service, distribution, and tactical field maintenance to the engineer battalion and to itself. The ESE leader is capable of cross-leveling between the engineer repair section/ teams to weight the main effort as logically required. The three forward-engineer repair sections and three engineer CRTs provide the immediate capability and task organization flexibility to support our FXXI engineer battalions. *Figure 6-3, page 6-6,* shows the ESE organization and its assigned personnel and major equipment.



Engineer Support Element Major Equipment

Headquarters	
HMMWV	Command and control, communications and mobility

Food Service Section	
2 1/2-ton truck	Supporting the food service section's requirement to feed assigned/attached personnel

Distribution Section	
HMMWV	Tactical mobility for the section leader
HEMMT cargo trk – (3)	Movement of other classes of supply and equipment
HEMMT fuel trk, 2500 gal - (6)	Prime mover for bulk POL

3 – Forward-Engineer Repair Section (Total)	
HMMWV - (4)	Tactical mobility for maint tech and section
Truck cargo: LTV - (3)	Transports major assemblies and section equipment
Truck cargo: MTV - (3)	Transports major assemblies and section equipment

3 – Engineer Combat Repair Teams (Total)	
Recovery vehicle, M88A2 – (3)	On-site recovery asset
Contact truck – (3)	On-site contact maintenance
HMMWV – (3)	Tactical mobility for maintenance team
Truck cargo: MTV – (3)	Transports major assemblies and teams equipment
Heavy contact maintenance truck: PLS mounted (HCMTP) – (3)	Provides on-site DS maintenance capabilities

Engineer Support Element Personnel

Headquarters			
Logistics Officer	03	90A00	1
Engr Equip Maint NCO	E7	62B40	1
Operations Sergeant	E7	88M40	1
Pwr-Gen Equip Rep	E5	52D20	1
Equip Rec/Parts SGT	E5	92A20	2
LT Wheeled Veh Mech	E4	63B10	1
Recovery Veh Operator	E4	63S10	1
Track Veh Mech	E4	63Y10	1
Equip Rec/Parts Spec	E4	92A10	2
Pwr-Gen Equip Rep	E3	52D10	1

Food Service Section			
Senior Food Opns SGT	E7	92G40	1
Senior First Cook	E6	92G30	1
Cook	E5	92G20	1
Cook	E4	92G10	3
Cook	E3	92G10	3

Distribution Section			
Pet Veh Supv	E6	77F30	1
Pet Hvy Veh Op	E5	77F20	2
Pet Hvy Veh Op	E4	77F10	4
Vehicle Driver	E4	88M10	2
Vehicle Driver	E3	88M10	1

3 – Forward-Engineer Repair Sections (Total)			
Engr Rep Tech	W3	919A0	1
Section Chief	E7	63H40	1
Track Veh Rep	E5	63H20	3
Welder	E4	4B10	3
Lt Wheeled Veh Mechanic	E4	63B10	3
M1 Tank Auto Mech	E4	63E10	3
Wheeled Veh Rep	E4	63W10	3
Track Veh Mech	E4	63Y10	3
Track Veh Rep	E3	63H10	3

3 – Engineer Combat Repair Teams (Total)			
M1 Tank Maint Supv	E7	3E40	3
Const Equip Rep	E5	62B20	3
Recovery Veh Op	E5	63H20	1
Recovery Veh Op	E5	63Y20	2
Track Veh Mech	E5	63Y20	3
Const Equip Rep	E4	62B10	3
M1 Tank Auto Mech	E4	63E10	3
Recovery Veh Op	E4	63H10	1
Recovery Veh Op	E4	63Y10	2
Track Veh Mech	E4	63Y10	3

Figure 6-3. Engineer support element organization (personnel and equipment)

Headquarters Section

The functions of the headquarters section are to provide C^2 and overall supervision of the element and its assigned and attached personnel. Through the direction of higher HQs and the allocation of a logistics officer (03/90A00) as the leader, an engineer senior equipment maintenance NCO (E7/62B40), and an operations sergeant (E7/88M40), the headquarters section is capable of providing a flexible C^2 environment.

Food Service Section

The food service section is responsible for planning and conducting food service support to the engineer battalion and for providing Class I support using its assigned MKT and KCLFFs. When an engineer company is task organized in an **attached** command relationship, the food service section is modularized into an engineer package and task organized to that maneuver task force's FSC.

Distribution Section

The function of the distribution section is to provide POL and supply point distribution to the engineer battalion. This section, like the others, is capable of operating as a modular engineer package and is task organized to the task force's FSC. Distribution capabilities outside of bulk POL are extremely limited. Their three assigned HEMMT cargo trucks provide limited movement of other classes of supplies and equipment and provide a surge capability.

Forward-Engineer Repair Section/Engineer Combat Repair Teams

The function of the engineer repair section/engineer CRTs is to provide contact support for engineer equipment. Each of the engineer repair sections provides C^2 of the CRTs. The enginer repair technician (W3/919A0) and senior maintenance section chief (E7/63H40) provide the engineer battalion with maintenance knowledge and task organization flexibility expertise in support of maintenance activities. Each engineer CRT is organized with mechanics, recovery assets, contact trucks, cargo trucks, and a heavy contact maintenance truck (HCMT) and is supported with surge capability in the forward engineer repair sections. Overall, the CRTs have a fairly robust maintenance capability with the agility and flexibility for rapid task-organization changes.

Regardless of the task organization, each engineer CRT is always collocated with the engineer company to provide it immediate, forward repairs, and the team "works for" the engineer company 1SG even though its higher headquarters is the ESE.

BATTALION LOGISTICS ESTIMATES

Logistics estimates analyze factors affecting mission accomplishment. Logistics planners use estimates and logistical situation reports (LOGSITREPs) to make recommendations and conclusions concerning proposed COAs and to develop plans to support selected schemes of engineer operations. The key concerns of logistics planners are the status of supplies (Classes III, IV, V, and VII) and the operational status of combat vehicles.

Logistics estimates are rarely written. They are frequently formulated in terms that answer the following questions:

- What is the current status of maintenance, supplies, and transportation?
- How much supplies are needed to support the concept of operations?
- How will the supplies get to where they are needed?
- What type of external support (FSB or supported unit) is needed?
- How can the requirements be met using LOGPAC operations? Will other techniques be necessary?
- What are the negative impacts on other CSS plans?

The XO ensures that the S1, S4 and HHC commander stay abreast of the situation in each of their respective areas. He does this by

war gaming COAs with the CSS staff officers and by ensuring that the CSS sections aggressively execute fully developed plan. The XO participates in and directs CSS rehearsals and conducts network calls on the A&L network to coordinate the plan.

The main CP monitors key CSS factors such as—

- Last LOGPAC resupply.
- Number of operational combat systems
- Overall personnel status.

The ALOC updates the main CP on these factors when a significant change is noted, or it can be updated on a recurring basis as established in the tactical SOP.

SUPPORT OF OFFENSIVE OPERATIONS

In planning for the sustainment of offensive operations, the logistic priority is to maintain the momentum of the attack. A successful attack may develop into an exploitation or a pursuit, and the CSS planners must be flexible enough to support either contingency. The following considerations apply to CSS planning for offensive operations in support of the digitized engineer battalion:

- Establishing the criteria for using FBCB2 logistics reporting.
- Positioning an engineer logistical cell in the BSA to ensure continuous digital communications with the supporting FSB elements, while maintaining adequate security and defensive measures.
- Specifying the conditions when using the automated medical-evacuation (MEDEVAC) reports in casualty-evacuation operations.
- Requesting the pre-position of high-use LRU forward with the engineer CRTs.
- Planning for and integration of engineer Class IV/V push packages and combat-configured loads (CCLs) for the offense and for transitioning to the defense.

During planning, the battalion S4 and/or HHC commander prepares both the traditional acetate overlay and the FBCB2's equivalent overlay. When the FBCB2 operations overlay is received from the company CPs, the BSC SPO, in coordination with the engineer battalion S4, enters the CSS graphics and control measures. These graphics typically include proposed BSA locations, primary and alternate MSRs, ambulance exchange points (AXPs), and classes of supplies point locations.

NOTE: Due to limitations inherent in the automated symbol set, the FBCB2 CSS overlay makes extensive use of checkpoints to represent supply points, AXPs, logistics release points (LRPs), and MSRs.

SUPPORT OF DEFENSIVE OPERATIONS

CSS operations are critical to the defensive preparation phase. Logistics planning considerations for defensive operations are similar to those outlined for the offense, with the following additions:

- Identifying engineer-specific types of Classes III, IV, and V (Class IV/V push packages and combat-configured loads) for delivery to centrally located LRPs and prestock locations.
- Anticipating and planning for increased transportation cargo-carrying capacity that will be generated by the engineers for Class IV/V in the defense.
- Conducting resupply operations during periods of limited visibility to reduce opportunities for enemy interference.
- Using embedded diagnostics to troubleshoot and repair vehicles forward in designated positions. These measures include the self-test (ST), built-in test (BIT), and fault-isolation test (FIT) on the Grizzly, Wolverine, and the engineer squad vehicle.

Planning considerations for developing an FBCB2 CSS overlay in support of the defense are similar to those discussed earlier for offensive operations.

SUPPORT OPERATIONS

The two types of support operations are shown below. These operations include regular resupply of all classes of supplies:

MISSION SUPPORT

Mission support is designed for a specific maneuver operation. The designated engineer CSS elements conduct mission support to ensure maximum engineer equipment is available to support the fight and the specific operation is not hampered by a lack of supply support.

CONTINUOUS SUPPORT

Continuous support operations keep the engineer equipment sustained over a period of time. Continuous support operations are conducted as close to the supported unit as practical.

CLASSES OF SUPPLIES

The resupply of Classes II, III (P), IV (-), VII (-), and IX (-) are a result of on hand information from the platoon sergeants (PSGs). These classes of supplies come from the S&T platoon of the BSC through the company supply section. The company 1SG identifies the correct on-hand quantity and type of these classes of supplies to the engineer battalion S4 using the FBCB2 LOGSITREP. This causes the delivery of a preconfigured load through the BSC to the company supply section. Tactical resupply techniques are discussed later in this chapter.

There are 10 classes of supplies (Classes I through X). During defensive operations, Class IV/V are in high demand. During offensive operations, Class III (B) is in high demand.

CLASS I

Class I consists of subsistence and gratuitous health and welfare items. Unit distribution is used in delivery of rations to the platoon. Quantities are determined by the unit strengths transmitted using digitized reports.

CLASS II

Organizational clothing and individual equipment (OCIE) support is not normally available at the battalion. The S&T platoon of the BSC in the FSB provides supply-point distribution of limited quantities of OCIE in the BSA. The BSC also provides supply support for other Class II items, such as tentage, tool sets, and administrative and housekeeping supplies. These items are moved to forward locations when dictated by the tactical situation and METT-T.

CLASS III

Class III consists of POL, including petroleum fuels, lubricants, hydraulic and insulating oils, preservatives, liquids and gases, bulk chemical products, coolants, deicer and antifreeze compounds, components and additives of petroleum and chemical products. When the battalion TF is preparing to defend, additional Class III (B) is required for most engineer equipment. For example, the ACE requires fuel every 8 hours if heavily used. Forward fueling at the work sites should be a standard procedure. Refueling operations are typically conducted using a combination of unit distribution and supply-point distribution. When the unit uses the supply-point distribution method, the following procedure may be used:

- The 1SG reports the supply point to the XO using a Global Positioning System (GPS) grid coordinate.
- The XO adds checkpoints and waypoints to the automated operations overlay using FBCB2.

- The engineer platoons navigate to the resupply site using EPLRS/Precision Lightweight Global Positioning System Receiver (PLGR).

This technique speeds up the resupply process and prevents individual vehicles or entire platoons from becoming lost.

CLASS IV

Cache or throughput to the barrier site of Class IV/V (mines) is a procedure used in preparation for defensive operations. Based on unit requirements, the following items are normally throughput from corps assets:

- Construction materials.
- Barrier materials.
- Mines.

CLASS V

Technological advancements in real-time forecasting of Class V sustainment requirements enhance logistics planning and support. Throughput distribution of Class V items, packaged to weapon system requirements, also reduces the need for stockage of ammunition at the ammunition supply point (ASP) and the use of ATPs. Engineers need some unique Class V supplies, such as cratering and line charges. This need requires special planning and coordination by the engineer battalion S4 to ensure these unique ammunition requirements are input into the Class V system.

CLASS VI

This class covers personal demand items, such as candy, cigarettes, and toiletry articles that are normally sold through the exchange system during peacetime. In a combat environment, these items are transported with Class I as health and comfort packs (sundry packs).

CLASS VII

This class includes major end items. These are major pieces of equipment that are assembled and ready for use. These include radios, tool sets, combat vehicles, and other major end items. Destroyed or inoperative major end items are immediately reported using the LOGSITREP. The supporting CSS unit replaces major end items as they become available.

CLASS VIII

This class includes medical supplies that are provided through the medical company of the FSB. Included are individual medical supplies such as first-aid dressings, refills for first-aid kits, water-purification tablets, and foot powder. Requirements for combat lifesaver bags are reported using the LOGSITREP through the 1SG to the FSB medical company.

CLASS IX

Repair parts are stocked at BSC level based on usage requirements (combat spares). The BSC maintenance platoon's administration section manages repair parts. The FBCB2-equipped engineers obtain repair parts either from the Class IX supply point in the BSA or by throughput from other echelons of supply-support organizations. Parts are moved forward to the engineer CRT location during routine LOGPAC operations or as required. The maintenance platoon requests Class IX items (less repairable exchange) and major Class IX subassemblies, such as engines and transmissions, by submitting requests to the BSC.

CLASS X

Class X consists of materials to support nonmilitary programs, such as agriculture and economic development.

SPECIAL CLASS IV/V SUPPLIES

These classes of supplies (referred to as loads) form the majority of the materials used by engineers to construct obstacles and fortifications for the defense. There are two classes of loads: mission and basic.

Mission Load

Mission loads consist of those materials required for a specific mission that are

formed into engineer Class IV/V packages or CCLs. Standardized engineer Class IV/V packages are configured and dictated by the unit's SOP to provide commanders the flexibility to achieve their unique operational and mission-support requirements.

Mission loads are a TF responsibility regardless of the command and support relationships specified for engineers. Logistical planners within the engineer and the maneuver force structure must understand the requirement for integrating the maneuver commander's intent, obstacle resourcing requirements, and their planned CSRs at the brigade and the division level when developing Class IV/V packages. Class IV/V planning requires a degree of crosswalk and coordination between the division engineer cell, maneuver brigade S4, engineer battalion S4, and the brigade FSB support operations officer.

Corps assets normally push the quantity of Class IV/V packages. Delivery of Class IV/V packages residing with the FSB will stretch or exceed the transportation assets of the TF and the FSB S&T platoon. Class IV/V packages for the defense is one of the most demanding logistical operations the TF must carry. It requires all the assets that can be made available and a total cooperative effort by the TF, including engineers.

Time planning for Class IV/V packages is generally conducted on 12- or 18-hour increments, but will very depending on the division and the corps SOP. The concept of Class IV/V packages is preconfigured loads, such as a standard fix minefield, MICLIC reloads, VOLCANO reloads, demolitions, and wire packages, which are pushed to the user at the obstacle-emplacement site. Thorough planning includes the quantity and the type of packages, the maneuver TF's logistical release points (LRP), and the time of linkup. Because corps packages run either on 12- or 18-hour increments, logistical planners must coordinate with operational planners on the type of operations (defense or offense) they are supporting at that time increment. Logistical planners at the brigade level must focus on future operations at least 72 hours out. Changing a corps package may require at least 9 hours of lead time.

In the offense, TF planners anticipate Class IV/V mission loads for even a hasty defense on the objective and send a digital status/ request through the FBCB2 to the engineer battalion S4. Information copies are sent to the maneuver TF S4 and the BCT S4.

Basic Load

For classes of supply other than ammunication, basic loads are supplies that are kept by the unit for self-protection. The quantity of each item of supply in a basic load is based on the number of days the combat unit may have to sustain itself (without resupply) and on available transportation assets. The basic load is demand supported and will be replenished from the mission load. For ammunition, the basic load is the quantity of ammunition required to be on hand that will meet combat needs until resupply can be accomplished. The basic ammunition load is specified by the theater army and is expressed in rounds, units, or units of weight, as appropriate.

CSS MESSAGES AND MESSAGE FLOW

The LOGSITREP provides input for logistics status reporting for Classes I, II (P&B), IV, V, VII, and limited VIII. The LOGSITREP primarily flows through the NCO chain of command to the engineer battalion S4 and the supported maneuver brigade S4. Information copies are sent to the FSB and BSC support- operations sections. All reports will follow the chain of command as specified in the unit task organization (UTO). As each unit's report is submitted to the next higher echelon, information copies are sent to key personnel. For survivability of the reporting process, key personnel are identified to

replace the primary roll-up point personnel should they become nonoperational. At brigade level, the maneuver brigade S4 submits company-level roll-up point personnel to the CSSCS.

All recipients of the LOGSITREP (action or information message) have the ability to look one level of command down. This gives that user the ability to see the report submitted at that level for each class of supply and any comments that were made. Comments made with the LOGSITREP cannot be rolled up. Any comments necessary for further processing up the reporting chain must be reentered in the next report.

The purpose of the LOGSITREP is to provide the unit commanders and key personnel visibility of the latest logistics status of their unit. A secondary purpose of this report is to provide the CSS unit visibility of the engineer unit's logistics status to better anticipate the companies' logistics requirements. Optimally, the company will not have to request resupply of commodities reported through this report because the CSS unit is aware of their requirements and can begin the necessary CSS action before the company has to ask for it.

LOGISTICS CALL FOR SUPPORT (CFS)

Any platform with an FBCB2 can request CSS through the logistics CFS message function. The CFS is a templated message and may be sent directly to the supporting logistics activity but should be sent to the engineer company 1SG. This procedure enables immediate support action on the battle space, a combat multiplier. Any FBCB2 can send or receive a CFS message. The purpose of this message is to request CSS support. The LOGSITREP is used to report on-hand quantities of classes of supplies.

The CFS is entered as a templated message and transmitted, per unit SOP, to the supporting logistics organization providing the service or support. The FBCB2 system hosts six categories of logistics CFS requests. These are maintenance, transportation, supply, medical, religious, and others (see *Table 6-1).*

LOGISTICS TASK ORDER (LTO)

Once the appropriate CSS activity receives the CFS, the CSS manager identifies the most appropriate CSS resource to execute the mission. The CSS manager (tasking authority) sends a LTO to the resource. This message is the same template as the CFS message; therefore, the requesting unit and its location are specified in the order. Once

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Table 6-1. FBCB2 logistics call for support

Maintenance	**Transportation**	**Supply**	**Medical**	**Religion**	**Other**
Repair Recover Services Information	Pickup Delivery Information	Class I Class III Class IV Class IX Laundry Bath Mortuary Affairs	Evacuation Medic Class VIII Information	Worship Pastorial care EPW/refugee Support Funeral services Memorial services Information	

the CSS resource receives the message, the FBCB2 will prompt it to return an acknowledgment (ACK) message stating: will comply (WILCO), cannot comply (CANTCO), or have complied (HAVECO). If the resource replies with a WILCO, it will also be prompted to send an acknowledge of IDLE or ACTIVE. This action specifies whether the resource is actively executing the mission or is working on another mission. Once the acknowledgment has been transmitted, the resource will conduct synchronization with the requesting unit by sending a free-text message.

SA OVERLAYS

The FBCB2 operator can gain SA by activating the overlay feature of the FBCB2. The CSS overlay depicts the various CSS assets in the BCT sector. The overlay has icons depicting CSS assets such as supply points, CSS CPs, and LRPs. These points are posted to the CSS overlay by the BCT S4. Supply-point locations are sent to the S4 through free-text message for posting or updating the CSS overlay. An information copy is sent to the FSB support-operations cell. This feature assists supported elements in locating key CSS supply activities during supply-point distribution and also assist the supporting CSS units in locating supported units when conducting unit distribution.

The FBCB2 operator can pick up visibility of the CSS assets' operations within the BCT AO. These assets automatically transmit position reports that update each FBCB2 screen within a UTO. These updates are frequent and maintain near real-time SA. CSS synchronization with the supported element will depend heavily on this position-update feature of the FBCB2. For example, if an ACE needs recovery, it will submit a CFS through the PSG and the 1SG. The CFS messaging will task a recovery vehicle (M88) to recover the ACE. If the M88 is equipped with a FBCB2, the LTO message it has received will identify requested recovery. During the synchronization process, the M88 will send a free-text message to the supported 1SG stating that it will conduct the recovery mission and will coordinate the most appropriate time to conduct it. The M88 will then identify and select the ACE's icon on the SA map on the screen. The ACE can do likewise to observe the supporting M88 as it approaches the ACE. This feature prevents any confusion in locating the ACE and significantly increases the tempo of CSS on the battle space.

REAL- AND NEAR REAL-TIME MESSAGING

CSS reports such as the LOGSITREP and the CFS report provide near real-time data that informs the combatant of the current logistics situation as opposed to data that may be hours old. The currency of the data provided the CSS manager facilitates the identification of requirements for supported elements more quickly.

SUPPLY OPERATIONS

Each engineer battalion has a large amount of equipment and requires frequent resupply to accomplish its mission. Through digitalization and automation of reporting procedures, these resupply actions can now be accomplished with greater precision and speed. All leaders must make periodic checks to ensure that their equipment, especially high-use items, are accounted for and ready to use. They must anticipate expenditures and request supplies before an operation begins. The engineer companies receive their CSS from the ESE of the BSC. Organic medics located in the engineer battalion HHC and combat lifesavers (CLS) provide CHS within the various engineer platoons. The engineer company commander establishes priorities for delivery of supplies. The 1SG ensures distribution of supplies within the company. The PSG distributes supplies within the platoon.

Providing, coordinating, and synchronizing logistical support is more critical than ever. Arming, fueling, fixing, moving, and sustaining are provided in conjunction with the respective FSB. The manning function is provided by the personnel section. This section will discuss the tactical logistics functions throughout the engineer battalion that will give the engineer commander and his staff an understanding of what and how CSS integrates into operations.

ARMING

Arming involves the activities necessary to provide ammunition for the battalion's weapon systems. Combat-configured loads (CCLs) are prepared for use during the initial stages of deployments. Thereafter, the battalion is sustained by ammunition packages configured for each weapon system based on the tactical situation; these are pushed as far forward as possible.

Reporting Unit-Level Ammunition Status

The status of the unit's on-hand ammunition is reported, as required by unit SOP, using the FBCB2 LOGSITREP. The report is sent to the 1SG, and an information copy is sent to the engineer company commander. The 1SG consolidates the unit's on-hand quantities and forwards them via the FBCB2 LOGSITREP to the engineer battalion S4. Information copies are sent to the engineer battalion commander and the S3. In the LOGSITREP, company commanders will indicate any critical ammunition shortages or changes in forecasted ammunition requirements. When required, unit commanders will cross level on-hand ammunition within platoons or throughout their company. Ammunition cross-leveling orders will be directed by FM voice or free-text message using the FBCB2 free-text format.

Determining/Requesting Engineer Battalion/ Company Ammunition Requirements

The engineer battalion S4 determines ammunition resupply requirements based on information provided in the LOGSITREP and guidance received from the engineer battalion commander and S3. The S4 consolidates the entire battalion's ammunition requirements that are submitted by company roll-up to the brigade S4. The BCT S4 consolidates the ammunition request and passes it to the division ammunition officer (DAO). An information copy is sent to the FSB SPO. The DAO uses the information copy to determine if on-hand stocks in the ATP are sufficient, or if ammunition from the corps support area (CSA) or theater support area (TSA) will be required. The brigade S4 will use the CSSCS Class V ATP report (CS-5-005) to determine what items on the commander's tracked item list (CTIL) require special attention, such as immediate resupply. The SPO consolidates the brigade's ammunition requirements and submits an FBCB2 logistics CFS to the DAO. When required, battalion commanders will cross level within companies or throughout the battalion to meet mission requirements. Ammunition cross-leveling orders will be directed by an FBCB2 free-text message. The battalion S4 reports the unit's on-hand ammunition quantities by nomenclature. He reports critical shortage of and any forecasted changes in requirements to the brigade S4 via the LOGSITREP. The ATP operated by the FSB is also responsible for supporting all units located in the brigade rear that are assigned, attached, or have established a support relationship or as directed by the division support command (DISCOM) commander. The support operations officer, with the DAO NCO representative, will coordinate directly with those nonorganic units that will be supported by the ATP. Their ammunition requirements are consolidated by the SPO or DAO representative, and their request for resupply is rolled up with the brigade's request.

Reporting Controlled Supply Rate (CSR)/ Priority of Issue

The SPO, with guidance from the brigade S3 and S4, informs the DAO by FBCB2 free-text message of the brigade's CSR breakout and the unit priority of ammunition resupply.

Forecasted critical ammunition shortages and changes in ammunition requirements as reported in the brigade's situation report (SITREP) are provided through the FBCB2 SITREP to the DAO.

Delivering Ammunition Resupply

The preferred method of ammunition resupply is to deliver as far forward as possible. If the situation requires it or transportation assets are available, ammunition will be throughput as close to the unit as possible. Standard-configured loads and mission-configured loads (SCLs/ MCLs) should be delivered to the BSC whenever possible. The engineer battalion S4 is notified of times and locations of delivery by the DAO or the division movement-control officer (DMCO). Units may request ammunition be pre-positioned for up load as needed. Coordination is made between the engineer battalion S4, the BSC and the DAO on the location the ammunition will be "blind-dropped." Corps transportation drivers report when and where the delivery was made through the FBCB2 free-text message and the movement tracking system or according to the unit's SOP. The engineer battalion S4 acknowledges receipt of ammunition by giving the transportation control movement document (TCMD) number to the brigade S4. The brigade S4 reports this information to the FSB SPO via free-text message. Information copies of this message are automatically forwarded to the subordinate unit commanders, the engineer battalion commander, and the brigade commander.

FUELING

Fueling includes meeting the total Class III requirements of the battalion.

Class III

Using the FBCB2, the status and requirements of on-hand fuel are reported from platoon level up (according to the unit's SOP) to the engineer company 1SG. Information copies are sent to the company commander and XO. The 1SG consolidates the unit's on-hand quantities and transmits a LOGSITREP via FBCB2 to the engineer battalion ALOC. Information copies are sent to the FSB support operations section. The battalion S4 consolidates, by company roll-up, Class III requirements and transmits a LOGSITREP to the BCT's S4.

Fuel is provided to the engineer battalion by either the engineer-support platoon distribution section or the distribution section of the BSC. A schedule for issue of bulk fuel is coordinated between the supported engineer battalion S4 and the BSC support-operations sections. The BSC distribution section also operates a mobile filling station to provide retail service in the BSA.

Immediate Resupply

If a company requires immediate resupply, the 1SG transmits a CFS (supply) to the BSC support-operations section. An information copy is sent to the battalion S4. The BSC support-operations section coordinates directly with the company 1SG for times and locations of immediate resupply operations. An information copy is sent to the battalion/TF.

FIXING

Fixing includes the functional areas of maintenance and recovery of equipment and repair and replacement of components.

The BSC maintenance platoon provides The Army Maintenance Management System (TAMMS) support for the engineer battalion. It uses the unit-level logistics system-ground (ULLS-G) and the Standard Army Maintenance System-1 (SAMS-1) to dispatch and schedule services for the battalion. The BSC maintenance platoon's engineer priorities are determined by the engineer battalion. The BSC maintenance platoon provides dedicated support to the engineer battalion. The platoon performs on and off system repairs, battle damage assessment repair (BDAR), diagnostics, and LRU replacement and replaces major assemblies in the unit-maintenance collection point (UMCP). The engineer company's CRT evacuates its equipment

to the maneuver TF UMCP that it is supporting. When necessary, the BSC maintenance platoon uses controlled exchange to perform repairs.

METT-T dictates the level of repairs. If time, tools, test equipment, and repair parts are available, the repair is completed on site. The platoon's Class IX is limited to small quantities of combat spares, major assemblies, and shop/bench stock. The BSC maintenance platoon also coordinates backup and pass-back maintenance requirements with the BSC support-operations section.

Maintenance-Control Section

The MCS is the primary manager for all tactical field maintenance in the BSC. The BSC MCS makes management decisions for executing missions for the engineer-support platoon's CRT. Through the BSC commander and the engineer battalion S4, the MCS can also redirect a CRT to assist another CRT if necessary. The MCS directs and executes the maintenance priorities of the engineer battalion according to the plan of the engineer battalion S4 and the direction of the BSC commander.

Recovery Section

The service and recovery section from the BSC provides dedicated recovery to the brigade's rear and backup recovery to the engineer CRTs and FSCs. Recovery is the process of retrieving or freeing immobile, inoperative, or abandoned materiel and returning it to operation or to a place where it can be repaired, evacuated, or otherwise disposed of. The use of the FBCB2 enables recovery vehicles to identify the exact location of the inoperable piece of equipment. Items that cannot be repaired on site must be recovered to the maneuver TF UMCP. If the engineer CRT exceeds its organic recovery capability, the NCOIC can send a CFS to the maneuver CRT for its M88, the FSC MCS, or the BSC MCS. The MCS tasks the service and recovery section for backup support. Equipment evacuation is a coordinated effort between maintenance and transportation elements. If the BSC maintenance platoon must evacuate a piece of equipment, the MCS coordinates with the BSC support-operations section.

Combat Repair Teams

The engineer CRTs are task-organized to provide tactical field maintenance for all systems organic or attached to the engineer company. The scope and level of repairs are based on METT-T. If time, tools, test equipment, and repair parts are available, the repair is completed on site. However, most of the support during operations will be BDAR, diagnostics, and on-system maintenance by LRUs. Emphasis is placed on replacement versus repair. The engineer CRT responds to the 1SG's and MCS's request or the FBCB2 CFS. Engineer CRTs are fully integrated into the company's operations plans. The engineer CRTs carry limited on-board/combat spares to help facilitate repairs forward.

Engineer CRT priorities are set by the BSC MCS. The engineer CRTs focus on completing repair jobs on-site if the tactical situation permits and/or within a time limit prescribed by the unit SOP. The goal is to repair as far forward as possible without having to evacuate the damaged vehicle to the rear. If the engineer CRT's workload is exceeded, the NCOIC forwards a CFS request by the FBCB2 for back-up support from the BSC MCS. The MCS prioritizes, plans, and issues orders to the appropriate BSC maintenance section after receiving a request. The FBCB2 allows the MCS to track SA of the current battles and usable CSS maintenance assets to conduct responsive maintenance. If deadlined equipment is not repairable due to METT-T or a lack of repair parts, the BSC MCS transmits a CFS message to the BSC support-operations section.

MOVING

This CSS function involves assisting in the planning for and the execution of the movement of battalion personnel, equipment, and supplies in the performance of logistics functions.

The transportation system ensures that all required personnel and supplies are delivered to the point of need on time. To achieve this goal, several principles are employed.

One principle involves the consolidation of transportation assets. Units are allocated only the assets that are mission-essential. Other transportation resources are consolidated so that movement-control elements can most effectively use the limited resources available.

The transportation system must be able to provide an uninterrupted flow of supplies to supported units as well as adjust to changes in the tactical situation. The consolidation of transportation assets and their centralized control, when coupled with emerging digital systems, provides flexibility and improves efficiency. Enhanced SA facilitates the logistician's ability to divert transport platforms to meet critical missions. The system is based on efficient use of resources. Although transfer operations may be necessary in some cases, throughput distribution is the preferred method. Additional transportation assets should never travel empty. Loads going to the same destination should be consolidated when possible. Movement-control elements should maximize use of returning vehicles for backhaul to minimize road-network congestion and maximize assets.

The S&T platoon in the BSC is the primary movement provider to the engineer battalion. The platoon is highly mobile and outfitted with equipment that allows it to keep up with the engineer elements and operate in all weather conditions and environments. The S&T platoon provides the transportation assets to distribute all classes of supplies and personnel to the supported engineer companies.

Internal requests for transportation will be consolidated at the BSC support-operations section. These requests are passed to the BSC S&T platoon. When requests exceed the capability of the transportation section, the requests are sent back to the FSB support-operations section that then forwards the request to the movement-control office (MCO) at the DISCOM.

External requests for transportation are initiated by the supported units and sent to the battalion S4 using the FBCB2 CFS transportation menu. These requests are consolidated and sent to the BSC support-operations section. If the request exceeds the BSC's capabilities, the request will be forwarded to the FSB support-operations section for action, which usually entails forwarding the request to the MCO at the DISCOM.

Supplies are received by the S&T platoon of the BSC either by pickup at coordinated points or by throughput delivery to a designated LRP. The engineer battalion S4 coordinates with the BSC commander for delivery to the requesting engineer company.

The engineer battalion S1 tracks inbound personnel replacements and coordinates their arrival with the engineer battalion S4 and the receiving units. The battalion S4 coordinates with the company 1SGs and the BSC commander for the replacements transportation. The EAD deliver the replacements by throughput to the BSA. Organic transportation assets then deliver the replacements to the designated unit.

The engineer company will move EPWs to the battalion/TF EPW collection point through the use of resupply backhaul. On arrival, the EPWs are consolidated and processed by the engineer battalion S1. The engineer battalion S4 will coordinate with the BSC commander for transportation of the EPWs to the brigade collection point. The company transports killed in action (KIAs) to the mortuary affairs collection point (MACP). The company 1SG coordinates with the battalion S4 for additional transportation requirements.

NOTE: The wounded and KIAs are never transported together, neither are KIAs

transported in a vehicle used to transport or store Class I.

The engineer battalion S1 processes the KIAs and updates the battalion battle roster. The engineer battalion S4 coordinates with the BSC commander to prepare and transport the KIAs to the brigade's MACP.

The engineer company is responsible for the transportation of soldiers that require evacuation but do not require an ambulance (nonlitter urgent or nonambulatory). The company 1SG coordinates for organic battalion or BSC assets to transport the walking wounded. If the walking wounded require evacuation beyond the forward aid station (FAS) or the main aid station (MAS), the company medic(s) coordinates with the BSA (FSB support-operations section) for medical transportation.

SUSTAINING

Sustaining the soldiers' activities include—

- Personnel service support (PSS) (personnel and administrative services, chaplain activities, legal-services support, postal service, public affairs, EPW administration, and finance services).
- CHS (preventive care, medical treatment, and MEDEVAC).
- Field service support (food preparation, laundry and bath, water purification, mortuary affairs, and air-drop operations).
- General supply support (subsistence items, clothing OCIE, water, POL, ammunition, barrier material, repair parts, and major end items).

Class I

Class I is automatically requested at the brigade based on the daily strength report. The company 1SG will daily consolidate all head counts and personnel SITREPs and transmit a LOGSITREP to the engineer battalion ALOC (S1/S4). Information copies are sent to the company commander and XO. The ALOC determines the Class I requirements for the engineer battalion and transmits a LOGSITREP, by company roll-up, to the brigade S4. Information copies are sent to the BSC and FSB support-operations section. The brigade S4 and the FSB support-operations section consolidates the brigade's Class I requirements and transmits a LOGSITREP to the DISCOM support-operations section.

When rations are ready for pickup, the brigade S4 and FSB support-operations section notifies the BSC and engineer battalion ALOC of the location and issue schedule. Rations are throughput on EAD assets to the BSA.

The food-service section in the engineer-support platoon draws rations. The food-service section provides food preparation for the engineer battalion. Food-service teams prepare hot meals to go forward to the engineer companies with the company LOGPACs. This section is capable of providing one T-ration meal and one A- or B-ration meal per day. The engineer battalion S4 coordinates with the BSC support-operations section for delivery of Class I to the companies.

Class VI

Class VI items are furnished without cost to the soldier through Class I channels when units have been operating under combat conditions for more than 15 days without Army and Air Force Exchange Service (AAFES) support or access to civilian markets. Class VI items are therefore restricted to items required for the minimum personal hygiene, comfort, and welfare of the soldier. Initial requirements are filled with bulk Class VI supplies. Interim supplies are obtained from AAFES stocks until sundry packs (packaged to meet the requirements of 100 persons for one day) become available. The sundry packs are requisitioned based on personnel-

strength data and are issued in the same manner as Class I supplies.

Water

The engineer battalion depends on the BSC for water purification and distribution. Water is moved forward with the engineer company LOGPAC by the company supply sergeant using organic water trailers.

Class II, III (P), IV, VII

Classes II, III (P), IV, and VII on-hand status are reported daily to the company 1SG using the FBCB2 LOGSITREP from unit level. This information is also sent to the company commander and company XO. The 1SG consolidates the unit's on-hand status and requirements and transmits a LOGSITREP to the engineer battalion ALOC. Information copies are sent to the BSC. The company commanders will insert remarks in their LOGSITREP concerning critical personnel, supply, or equipment shortages needed for the mission. When required, unit commanders cross level the supplies within their companies. The engineer battalion S4 consolidates requirements and transmits them, by company roll-up, to the brigade S4.

Company supply sergeants submit requests for Classes II, III (P), IV, and VII supplies through the ULLS-G to the BSC supply section. The supply section inputs the data in the Standard Army Retail Supply-System Objective (SARSS-O). If the supplies are on hand they are issued to the requester. Requests for items not on hand are forwarded through the SARSS-O. Supplies are delivered to the engineer company by the S&T platoon. Items that are command regulated will require approval before they can be issued.

Class IX

Class IX repair-parts requests are transmitted from the engineer CRT to the MCS. If the repair parts requested are not on hand, the MCS processes the requests through the ULLS-G to the BSC Class IX section. The Class IX section inputs the requested data into the SARSS-O.

Repair parts are issued in response to a specific request or a repairable (direct) exchange. The engineer CRT obtains repair parts from the MCS. The engineer CRTs may maintain some combat spares, but the majority of combat spares will be collocated with the MCS. Repairable exchange (RX) of selected repairables is handled as a simple exchange of an unserviceable for a serviceable.

Mortuary Affairs (MA)

To accomplish initial search and recovery operations, engineer units should maintain a quantity of human-remains pouches and personal-effects bags. Medical supplies such as disinfectants, litters, surgical gloves, and masks are requested from the FSB medical company.

Supported units recover and establish tentative identification of remains. The unit then transports the remains and effects to the MACP. MACP personnel ensure those recovering the remains have completed a Statement of Recognition for all remains and/or a Statement of Incident before departing the collection point. Once the remains are processed by MA personnel, they are placed in refrigeration.

MANNING

Manning comprises personnel-support activities that ensure the commander has the personnel required to accomplish his mission. It includes management of personnel readiness, replacements, and casualties.

This section augments personnel doctrine. It is meant primarily to provide guidance on the FXXI automated manning process. Through the predictive manning process, units will receive replacements that are verified by the FBCB2's strength information and allocated by the unit commander. This differs from the current process. Currently, detailed deliberate and hasty strength reports and by-name accounting are used to

report personnel strength. The digitized manning process facilitates the automated reporting of strength information. This section will describe the new automated processes and link them to the current processes. The desired end state is to eliminate unique tactical personnel-reporting systems. Eventually, soldiers will register to reporting weapons platforms, and the battalion S1 will absorb personnel-strength information from the SA and the SPOTREPs.

Process Overview

The digitized manning function of PSS provides accurate, useful, and timely information to the engineer commander. The commander requires accurate personnel-readiness information to select the best COA for successful mission accomplishment. This is achieved through the digitized systems that interface with tactical, CSS, operational, and strategic systems. The Personnel Service Support Control System (PSSCS) initiative is a confederation of digitized battle space systems that absorbs and manipulates data from other systems. The connectivity between PSSCS and FBCB2 systems enables the battalion S1 to immediately account for personnel through all operational phases and to requisition personnel on a timely basis to meet desired operational tempos. PSSCS speeds the manning process and reduces the time required to perform personnel requisition.

Personnel Service Support Control System

The PSSCS is an overall architecture of systems that handles battle space personnel data and performs the manning function at the tactical level. It leverages data in the FBCB2 to provide unit-readiness status on a near real-time basis. The software manifests personnel by reading bar codes on identification cards. It includes a loss estimator and stratification program to identify replacements required for anticipated shortfalls. The system absorbs personnel data from tactical communications within the ABCS.

As the system absorbs personnel information from variable message formats (VMFs) it adjusts strength figures. It has roll-up capability for the commander. The system may also account for civilians and joint and allied forces. These systems' capabilities give the battalion S1 accurate, timely, and useful personnel information that the commander needs for force manning. The S1 anticipates personnel shortages and pre-positions replacements based on the commander's intent. He provides the commander personnel-strength-readiness information early enough to influence the tactical decision-making process. PSSCS includes the multitechnology automated reader card (MARC) or the Real-Time Automated Personnel Identification System (RAPIDS), the Force XXI Manning System (FMS), and the FBCB2.

Multitechnology Automated Reader Card

This "smart" identification card contains a computer chip, bar code, magnetic strip, and printed information. Scanners rapidly read the information stored on the card to account, process, or assess deployment criteria. The card supports the following tactical functions:

- Soldier-readiness processing (SRP). Insertion of the card into an integrated-circuit chip reader (ICCR) determines if the soldier meets deployment criteria (medical, dental, personnel, and legal). The ICCR contains separate deployment criteria for different contingency locations.
- Manifesting. A scanner reads the soldier's social security card from the MARC bar code and identifies the soldier's pre-positioned record as deployed. The manifesting process creates the deployed database, which is the baseline for strength reporting.
- Medical treatment. The card can store medical information. When a medic or doctor treats an individual, they enter the treatment on the MARC. As the patient goes through different treatment levels, caregivers read their MARC to

determine the previous care given to the soldier.

Real-Time Automated Personnel Identification System

RAPIDS is the Department of Defense (DOD) identification card. It can display limited MARC functionality when MARC is unavailable.

FXXI Manning System

FMS is a software prototype designed to demonstrate the personnel functionality that is desired within the CSSCS. It includes a personnel database, as well as casualty estimation and stratification software. The system consists of a notebook computer with a printer. It is a stand-alone system with no connectivity to FBCB2 or CSSCS. FMS uses data from MARC to move records to the deployed database during manifesting. This new system will operate at the battalion level and above. It will provide by-name accounting of deployed personnel. Manning features planned within FMS include—

- Manifesting. FMS identifies personnel records using MARC/RAPIDS readers.
- Personnel accounting. The Personnel Accountability System (PAS) is the foundation to build the FMS database. FMS will account for civilians, other service members, or allies.
- Loss estimate. The logistics processor external medical-module (LPXMED) software in FMS provides automated casualty estimating based on the division's/unit's database, scenario and threat capabilities
- Casualty stratification program. Automated personnel-planning software (APPS) in the FMS will take the raw-loss estimate, produced by the LPXMED, and generate the probable grade and MOS based on the unit's assigned strength.
- Flexibility of data extraction. FMS is a program that is flexible enough to allow ad hoc queries.

Battalion S1 Responsibilities

The battalion S1 is the commander's principal staff officer for PSS. He advises the commander on personnel-support matters. For information on the personnel-support activities of personnel organizations (including brigade/battalion S1 sections) and authorities, see *FM 12-6*. The S1 has primary staff responsibility for coordinating PSS. This support includes personnel services, finance services, chaplain activities, command-information services, medical services, and legal services. The S1 prepares the unit's PSS SOP. The S1, with the S4's help, prepares the A&L portion of the unit's tactical SOP. The S1—

- Participates in the OPORD process.
- Develops the PSS annex materials.
- Coordinates PSS with other staff elements.
- Pays particular attention to MA, transportation, and medical support.

Organization and Functions

The battalion S1 section provides unit, legal, and personnel support. The battalion S1 functionally organizes the S1 personnel to execute the responsibilities of the element. The personnel sergeant assists the S1 by directing the activities of the three major elements.

The unit-support element is responsible for postal-operations management, morale, welfare, and recreation (MWR) program administration, and other unit-support programs such as equal opportunity (EO), sponsorship, Army drug- and alcohol-prevention control program (ADAPCP), line of duty (LOD), safety, and publications/blank forms. The legal-support element is responsible for reviewing officer or enlisted transfers and discharges. They also review military judicial or nonjudicial actions, courts, and boards. The functions of the personnel-support element include—

- Personnel accounting and strength reporting (PASR), readiness management, database management, casualty reporting, replacement

operations, personnel actions, and evaluations.

- Retentions, promotions, and reductions.
- Awards and decorations.
- Military pay and leave.
- Coordination of command-information activities, finance services, and chaplain activities.

Typically, the engineer battalion S1 operates from the ALOC in the BSA within the FSB base cluster. The battalion S1 collocates with the battalion S4 section in the ALOC. This allows cross training of personnel and makes continuous operations easier. The battalion S1 monitors the battle and personnel status in particular. Primary S1 responsibilities include the manning function, which ensures the commander has the personnel resources required to accomplish his mission. Manning includes management of personnel readiness, replacements, and casualties.

Communications

The ALOC is the NCS for the engineer battalion A&L net. The battalion S1 monitors the A&L net for personnel-significant information. The battalion S1 uses the battalion/TF communications network to transmit critical personnel information to the brigade S1 and the supporting personnel services battalion (PSB). The network may consist of secure and nonsecure voice, telecommunications, digital data or a FAX, and/or a courier.

The primary means of transmitting digital data to the brigade S1 and PSB will be through FBCB2 via SINCGARS. EPLRS relay stations will facilitate transmission over distances that exceed normal SINCGARS capabilities. A FAX transceiver, a teletype, and a data diskette will serve as a backup system should the primary system fail. Failure to transmit and receive real-time electronic data will make data less reliable. Consequently, its value as a tool in the commander's decision-making process will decrease.

MISSION AND FUNCTIONS OF UNIT-LEVEL 1 CHS

The mission and functions of unit-level 1 CHS elements are—

- Prevention of disease and illness through applied preventive-medicine (PVNTMED) procedures.
- Acquisition and immediate treatment of the sick, injured, and wounded.
- Clinical stabilization of the critically injured or wounded.
- Provision for routine medical care (sick call) and the immediate return to duty (RTD) of soldiers fit to fight.

Unit-level CHS within the engineer battalion is provided by the combat medics of the medical section assigned to the engineer battalion HHC. This enables the section to provide two medics per company and one medical coordinator at the battalion to assist in medical resupply and evacuation coordination. Each medic carries a combat first-aid medical kit to provide emergency medical treatment. With this limited capability, self-aid and buddy aid are critical. Unit training must emphasize combat lifesaving techniques beyond first-aid training.

There should be one combat lifesaver with a combat lifesaver bag per squad. Unit SOPs must require all vehicles to carry combat first-aid medical kits. They should also specify what these medical kits should contain. Medical treatment beyond what the aidman can do must be accomplished at the closest maneuver battalion aid station (BAS) and medical clearing station in the BSA. The FSB medical company operates the medical clearing station. It is essential that all elements of the forward engineer companies know the locations of these facilities.

The engineer battalion has no organic ambulances or dedicated evacuation means. Each company has to evacuate its own casualties to the BAS. Coordination with the combat medical section (CMS) of the closest TF is essential to provide ambulance evacuation.

Tracked ambulances will be located with the maneuver TF's CMS or with the FSCs.

Medical evacuation is the responsibility of the next higher level of medical support. For example, the FSB medical company evacuates patients from the BAS or coordinates with corps resources for medical evacuation. Patients are evacuated no further to the rear than conditions require and are returned to duty as soon as possible.

AREA SUPPORT

Level 1 CHS is provided on an area support basis to all organizations and units operating in a brigade or regimental operational area that do have organic medical elements.

UNIT-LEVEL MEDICAL SUPPLY

Normal medical resupply of the medical section is performed by the forward-support medical company (FSMC) through ambulance backhaul. Medical resupply may also be by preconfigured Class VIII packages throughput from the forward medical-logistics (MEDLOG) company.

In a tactical environment, the immediate medical resupply (ambulance backhaul) system is used. In this environment, medical supplies are obtained informally and as rapidly as possible, using any available medical transportation assets. The medical section submits supply requests to the supporting FSMC, who in turn fills requests and ships supplies forward. Request for items not available at the FSMC are forwarded to the forward MEDLOG company. The FSMC ambulances and corps air ambulances may, METT-T permitting, deliver medical supplies directly to the BASs. Class VIII resupply of combat medics and the unit combat lifesavers is performed by ambulances of the medical platoon.

LEVEL-1 CHS PLANNING

To ensure that CHS is responsive to the engineer battalion, the medical-section sergeant must attend all of the supported battalion's operational briefings and planning sessions. He is responsible for providing the CHS portion addressed in the A&L section of the battalion's SOPs, OPLANs, and OPORDs. The CHS planned for tactical operations is in an annex of the battalion's OPORD. It should include—

- Locations of forward treatment sites.
- Ground and air medical-evacuation routes, AXPs, and patient collecting points.
- Location of the supporting clearing station.

The combat health support plan (CHSPLAN) must be responsive and support the supported maneuver commander's intent. The CHSPLAN is best disseminated using the FBCB2, which shows preplanned treatment-team, FAS, MAS, and AXP locations. The CHSPLAN is keyed to the supported maneuver battalion's OPORD. Once approved, the engineer battalion OPORD is distributed to the engineer company commanders, elements of the medical section, the supported maneuver battalion/TF TOC, and the ambulance platoon leader of the supporting FSMC using the FBCB2. To effectively execute the CHSPLAN, the medical section sergeant monitors the tactical situation. He maneuvers the treatment teams and coordinates changes for AXP locations based on the progress of the battle. This allows the CHS system to rapidly clear the battle space of casualties, treat patients early, and return minimally injured soldiers to the fight.

The senior combat medical team medic normally collocates with the engineer 1SG. When the company is engaged, the senior medic remains with the 1SG and provides medical advice as necessary. As the tactical situation allows, the medic provides medical treatment and prepares patients for evacuation. The 1SG and medic will extract the casualty from the vehicle, with the vehicle's crew help (if possible), and administer emergency medical treatment. The medics move the patient to the FAS or to a patient collecting point to await further evacuation.

METHODS OF RESUPPLY

The engineer company uses voice or digital means to request and report the status of resupply. The method used is determined after an analysis of the factors of METT-T. Resupply methods are addressed in the MDMP and are included in *paragraph 4* of the OPORD. The three distribution methods of resupply are—

- Supply-point distribution. This form of distribution requires unit representatives to move to a supply point to pick up their supplies.
- Unit distribution. Supplies are delivered directly to the unit. A unit representative meets the resupply package at the LRP and guides the package to the company's position.
- Throughput distribution. This method bypasses one or more echelons in the supply system to minimize handling and to speed delivery to forward units. It is normally used for immediate resupply or for the supply of heavy and bulky items such as Classes IV and V.

LOGPAC OPERATIONS

The LOGPAC is the most efficient method for resupply of forward units. It is a method in which resupply elements are formed on the basis of the unit's logistics requirements. The execution of resupply is planned at the battalion level and executed at the company level and normally takes place at every opportunity. The company supply sergeant, under the supervision of the battalion S4 (who is in direct coordination with the BSC support operations section), organizes the LOGPAC at the battalion ALOC in the BSA. The engineer company LOGPAC is a mixture of BSC assets (maintenance, forward repair, S&T, and engineer-support platoons) that transport supplies to the company. A LOGPAC is tailored based on METT-T and usually consists of a supply truck (supplies, rations, and water trailer), a parts truck, an ammunition truck, and a fuel truck (see *Figure 6-4).*

The company supply sergeant assembles his LOGPAC at the BSA. Once the LOGPAC is prepared for movement, the supply sergeant moves the vehicles forward from the BSA to the company LRP or the link-up point. The company 1SG or his representative meets the LOGPAC and guides it to the company resupply point. The company then executes tailgate or service-station resupply.

TECHNIQUES OF RESUPPLY

The company LOGPAC is a mix of engineer and BSC assets that transport supplies to the engineer company. Replacements and hospital returnees travel to company locations on LOGPAC vehicles as required.

The tactical situation will dictate which of the following resupply methods the company will use: tailgate, service station, a variation of one type, or a combination of both types. The situation will also dictate when to resupply. Generally, the company should attempt to avoid resupply during offensive operations; resupply should be done during mission transition.

Tailgate Method

In the tailgate method, fuel and ammunition trucks, which have been handed off to the PSGs, are brought to individual vehicles. This method is used when routes leading to vehicle positions are available, and the engineer company is not under direct enemy observation and fire. This method is time-consuming, but it facilitates stealth and the vehicles can stay in place. If necessary, certain supplies can be hand-carried to vehicle positions to further minimize signatures (see *Figure 6-5*).

Service-Station Method

In the service-station method, vehicles move to a centrally located point for rearming and

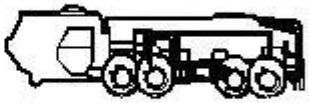
Personnel	Vehicle
Supply Sergeant	Engineer supply truck (supplies, rations and water trailer) 
Driver	BSC parts truck and trailer 
Driver	BSC ammunition truck 
Driver	BSC fuel truck 
NOTE: Based on METT-T, LOGPAC may be larger or smaller.	

Figure 6-4. Company LOGPAC

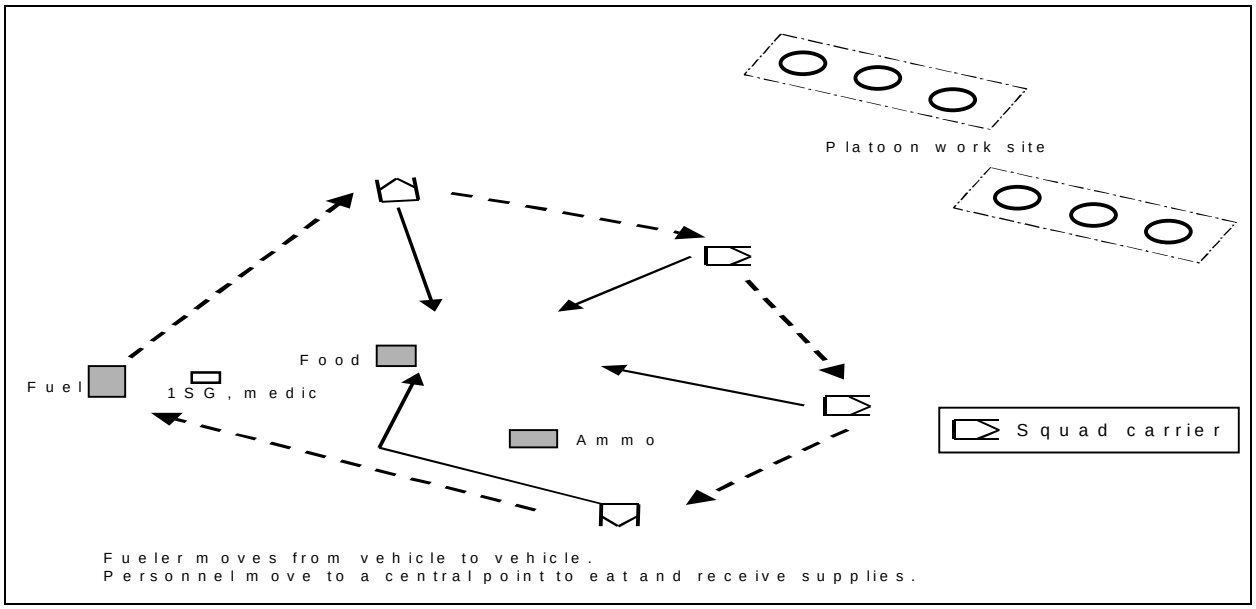


Figure 6-5. Tailgate LOGPAC

refueling, either by section, platoon, or an entire company. Service-station resupply is inherently faster than the tailgate method because vehicles must move and concentrate. However, the service-station method increases the security risk (see F*igure 6-6)*.

A company commander can vary the specifics of the two basic methods, or he can use them in combination for various platoons. During a defensive mission, for example, he may use the tailgate method for selected forward observation posts (OPs) and the service-station method for the remainder of the company (located in platoon positions). (For a modified tailgate LOGPAC, see *Figure 6-7*).

IMMEDIATE RESUPPLY

Immediate resupply (normally involving Classes III, IV, and V) is executed when the company has such an urgent need for resupply that it cannot wait for the routine LOGPAC. Immediate supply procedures start with the distribution of supplies, for example, the redistribution of ammunition in individual vehicles followed by cross leveling of ammunition within the platoon. It is better to have four Bradley engineer squad

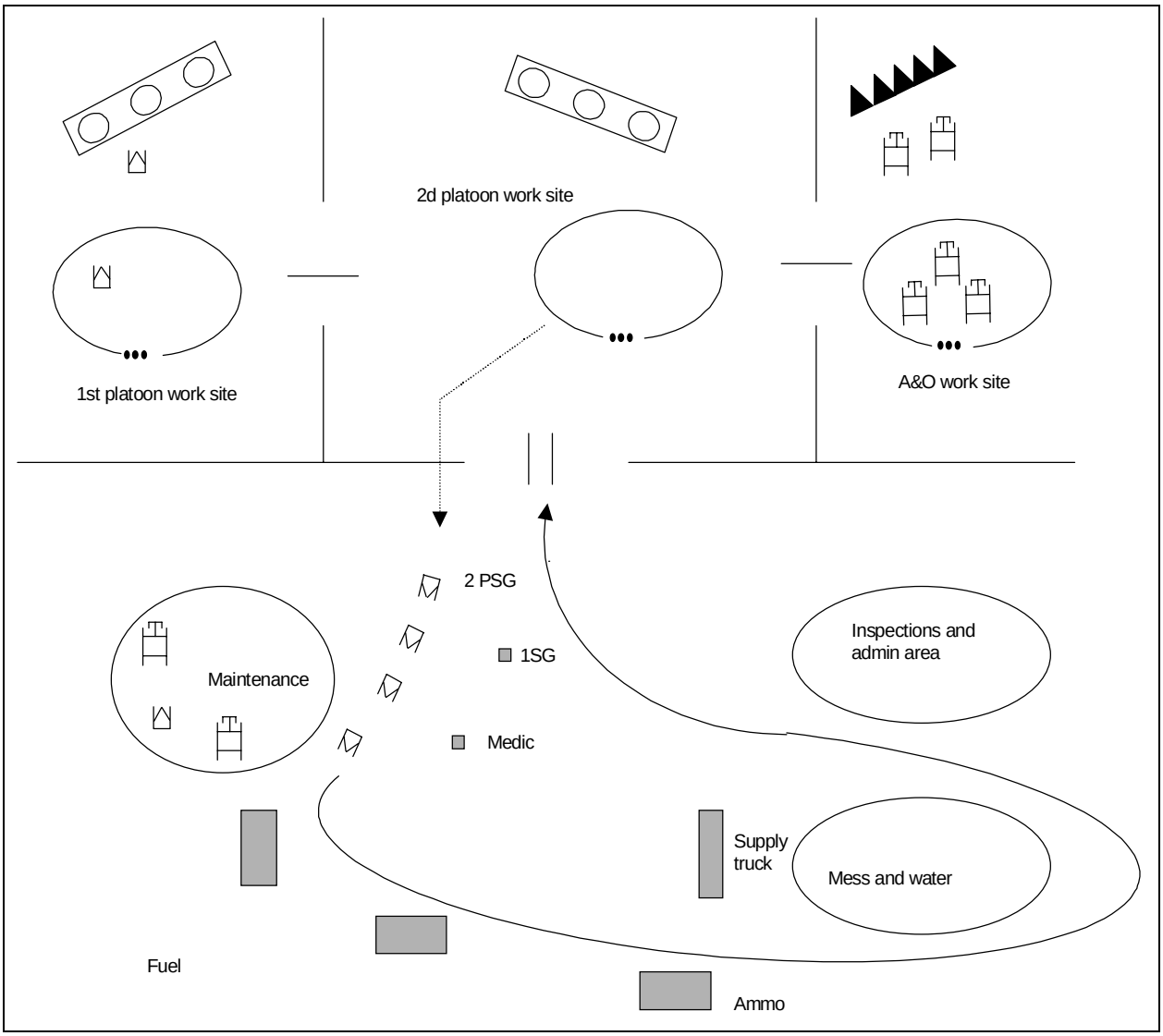


Figure 6-6. Service-station LOGPAC

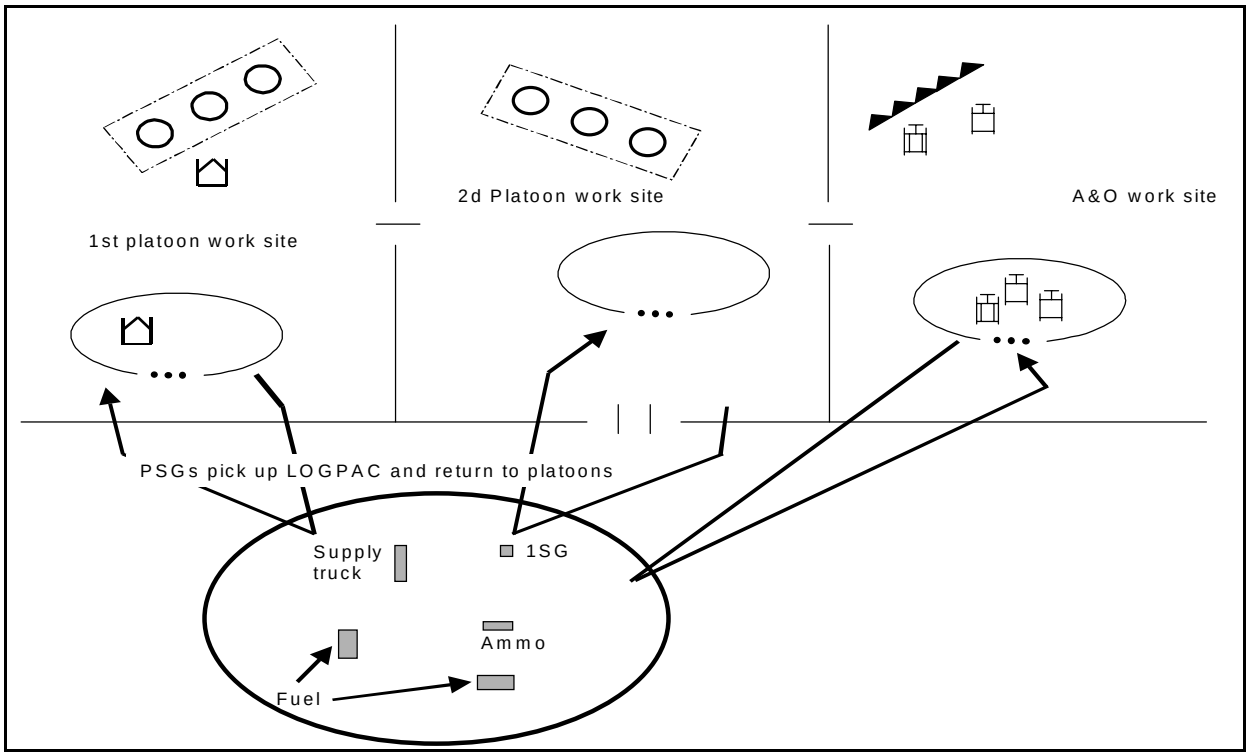


Figure 6-7. Modified tailgate LOGPAC

vehicles (BESVs) with 50 rounds of 25-millimeter ammunition each than two BESVs with 100 rounds and two others with none.

The commander or 1SG transmits a CFS for Class III, IV, and V through the FBCB2 to the support operations section of the BSC. Immediate supplies are brought forward by the S&T platoon of the BSC. Based on the enemy situation, the platoon may conduct resupply while in contact with the enemy. The following techniques are used to resupply platoons in contact:

- Limited supplies are brought forward to the closest concealed position where the tailgate method of resupply is used.
- Individual vehicles or sections disengage and move to a resupply point, obtain their supplies, and then return to the tactical mission. This is a version of the service-station method.

ENGINEER MISSION SUPPORT

Engineer missions require a well-coordinated and timely flow of CSS to enhance success. The following areas are important considerations for planning and ensuring CSS operations in support of engineer missions.

FORECASTING AND INITIAL LOGISTICS FLOW

This process begins with the receipt of the mission. The battalion S3 and S4 make initial estimates of the amount of munitions and materials needed to support an upcoming mission. Additionally, they identify equipment and personnel resources required but not currently available in the brigade. For example, corps bridging assets must be forecasted well in advance to ensure their availability and timely arrival.

The battalion staff makes initial estimates and submits these requirements to the division engineer cell and maneuver brigade staff. The estimates are then revised based

on the input received from the battalion. This process of estimating/revising plans is an ongoing process that continues until the operation is completed.

It is essential that the flow of logistics begins a early as possible due to the time required to mass large amounts of munitions and materials. Rough estimates are used early to get this flow moving forward. Adjustments/adaptations are made, as required. For example, to receive Class IV/V supplies, a request must be sent to the brigade S4. He forwards the request through the FSB. The FSB handles and monitors the remaining flow of supplies. The supplies are requested and delivered in the quickest mode possible.

Coordination must be made with other elements of the brigade staff to ensure that assets are available to deliver logistics. The brigade S4 and FSB commander are the principal players. The flow of obstacle material within the maneuver brigade sector is a maneuver unit responsibility. However, it is a shared responsibility between the engineer, the maneuver unit, and the FSB that is very effective.

LINE-HAUL OPERATIONS

The most efficient material-delivery technique is line haul from the point of origin directly to the Class IV/V supply point. This is called throughput and should be used whenever possible. This form of logistics delivery is well suited for large quantities of Class IV/V supplies. Because of the size of most loads being transported on corps transporters, material-handling equipment (MHE) is often needed to off-load the material. Normally, the equipment accompanies the transporters from the DSA/ BSA to the Class IV/V supply point.

CLASS IV/V SUPPLY POINT

The Class IV/V supply point is the central receiving point of obstacle material, such as mines, wire, and pickets. It is the point at which the maneuver unit receives and transfers control of the obstacle material that corps and/or division throughput haul assets pushed forward (see *Figure 6-8).*

Classes IV/V supply points are normally the responsibility of the maneuver TF in whose sector the obstacles are being constructed. The engineer battalion may have to establish and run a Class IV/V supply point when—

- Supporting a light TF defense.
- Constructing an obstacle system in support of a brigade or division EA.
- Supporting an economy-of-force mission.
- Conducting engineer TF operations.

The engineer S3 and brigade S4, in coordination with the FSB, plan Class IV/V supply points along the route of march. The battalion S4 is the key player in Class IV/V supply-point operations. Additionally, an engineer representative is needed to ensure that loads are properly configured. The backbone of the supply point is the work party. They unload, configure, and reload Class IV/V supplies to efficiently support the emplacing unit(s).

Personnel requirements include the—

- Battalion S4 (or representative)—
  - Tracks and accounts for the flow of Class IV/V supplies in and out of the supply point.
  - Ensures that Class IV/V supplies are properly stockpiled.
  - Coordinates for Class I and III supplies for a Class IV/V supply point.
  - Coordinates for medical support and develops an evacuation plan.
  - Coordinates for transportation support, if required.
- Engineer representative—
  - Ensures that Class IV/V supplies are broken down in the proper configuration, according to the tactical plan.
  - Ensures that mines, fuzes, boosters, and antihandling devices are properly configured with minefield packages.

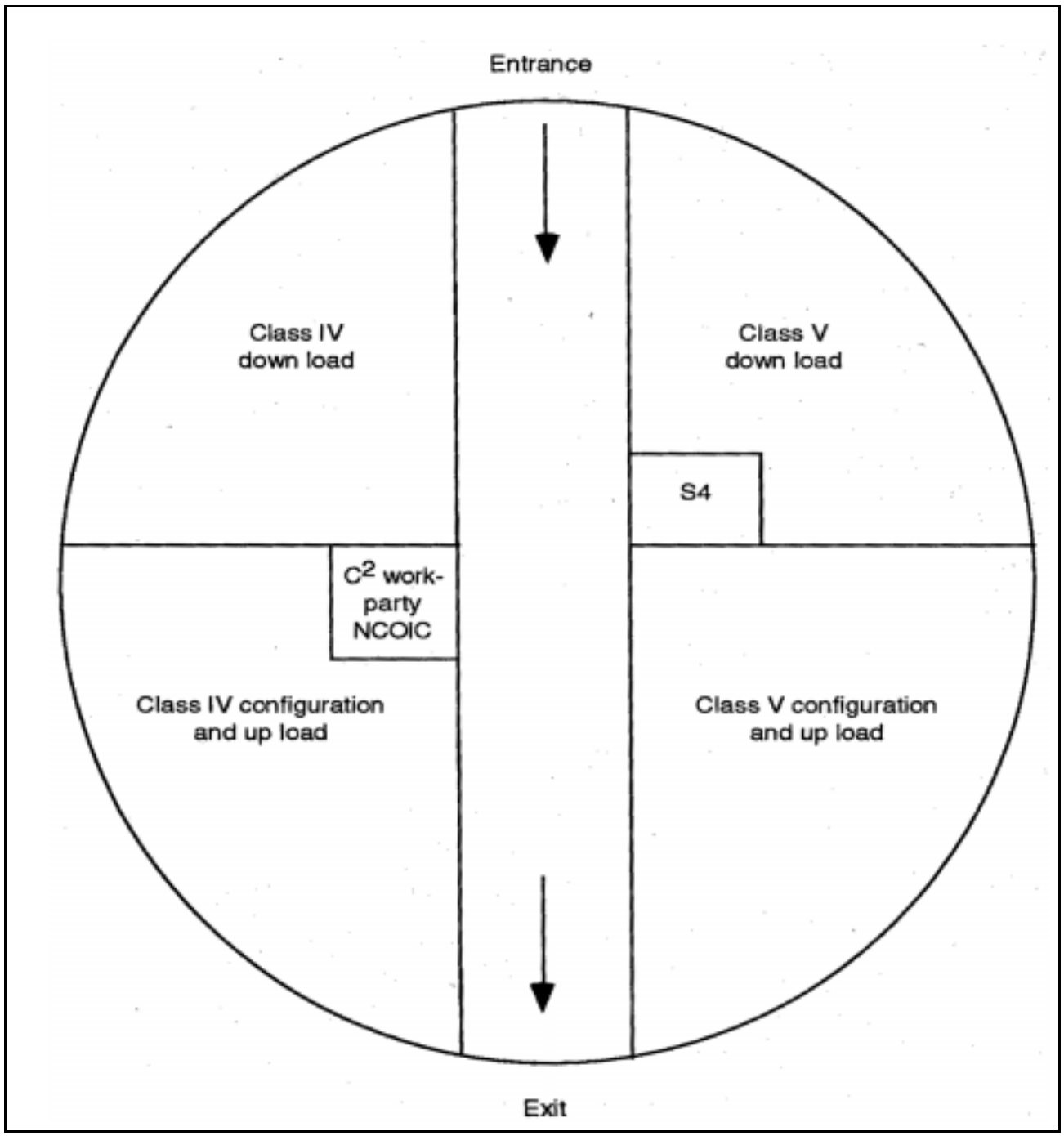


Figure 6-8. Class IV/V supply-point layout

- Work party OIC/NCOIC—Divides personnel into unload, configuration, and load crews.
  - Ensures that Class IV/V supplies are broken down in the proper configuration, according to the tactical plan.
  - Ensures that mines, fuzes, boosters and antihandling devices are properly configured with minefield packages.
- Work party OIC/NCOIC—
  - Divides personnel into unload, configuration, and load crews.

– Supervises the work effort and ensures that loads are properly configured.

– Develops a site security plan, to include access control in and out of the supply point.

– Forms reaction teams.

Transportation requirements include—

- MHE, such as a forklift, combat engineer vehicle (CEV) boom, or HEMTT cargo boom, to load and unload vehicles.
- Tin snips and crow bars to uncrate mines.
- Engineer tape and pickets to mark the Class IV/V supply-point layout.

SUPPORT TO EAD ENGINEER UNITS

EAD engineer units attached to the division receive CSS from the supported unit (normally divisional FSBs augmented by corps CSS assets).

The FSBs also provide logistics support and health-services support to these EAD engineer units when they support the division in close operations. Recent divisional logistics restructuring and the incorporation of a distribution-based supply system have left the division logistically lean. When EAD engineer units are attached to the division, division and corps staffs coordinate for corps support packages to be pushed to the division to augment CSS operations due to the division's limited capability to support attached units.

EAD engineer units that are OPCON, DS, or GS to the division and conducting missions in the division AO receive special support packages from the corps support group. The packages are tailored and sent to the DSA/ BSA to support these EAD engineer units. The corps support group, collocated with the DISCOM CP, assists in the CSS coordination for the EAD engineer units.

Regardless of the command or support relationship and location on the battle space, all engineer units operating in the division's AO must provide routine CSS status reports through the appropriate HQ. This will ensure that the CSS for engineer units and missions is fully integrated into the division's planning and coordination. EAD engineer units provide their own CSS for special low-density requirements through the S4 in their parent unit. These units will provide CSS status reports through their staff elements.

APPENDIX A

Engineer Organizations

This appendix contains engineer organizations that typically support brigade operations (see *Table A-1). Figures A-2 through A-11, pages A-2 through A-12,* show current tables of organization and equipment (TOEs) and are subject to modifications.

Table A-1 also depicts engineer organizations that typically support a maneuver brigade of a FXXI heavy force. The composition and structure of these organizations is shown in *Figures A-12 through A-14, pages A-13 through A-15,* as currently authorized by the conservative heavy division (CHD) organization. With some modification, the composition and structure of the engineer organizations that support a heavy division will also provide support to the FXXI light division.

Table A-1. Engineer organizations

Organizations
Division engineer battalion
HHC, division engineer battalion
HHC, division engineer battalion breakout
Support platoon, HHC
Engineer company, division engineer battalion
Line platoon, engineer company
Engineer combat battalion, corps, wheeled
Line company, engineer combat battalion, corps, wheeled
Engineer combat battalion, corps, mechanized
Line company, engineer combat battalion, corps, mechanized
Combat support equipment company
FXXI Engineer battalion, heavy division
FXXI HHC, engineer battalion, heavy division
FXXI Engineer company, heavy division

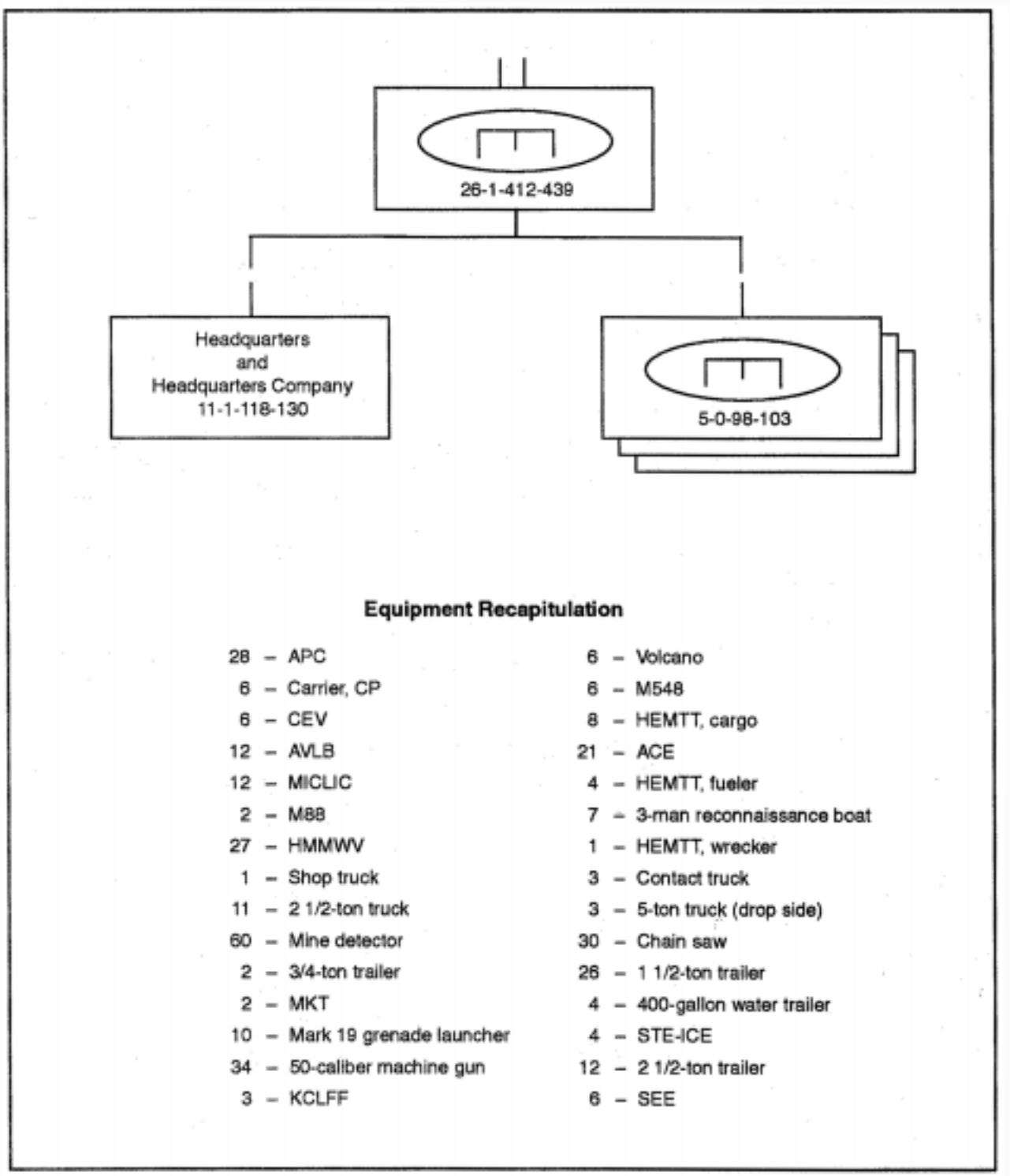
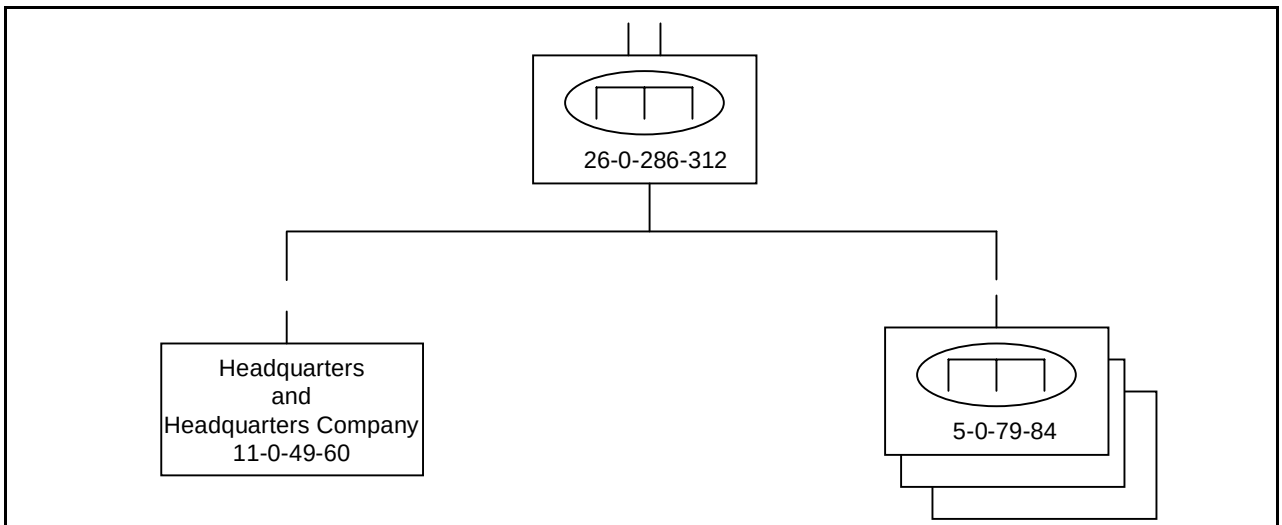


Figure A-1. Division engineer battalion



Equipment Recapitulation

4 - Carrier, CP
1 - APC (M113)
13 - HMMWV
3 - Medium tactical vehicle (MTV) truck cargo
1 - LMTV
2 - 3/4-ton trailer
1 - Water trailer

27 - APC
15 - HMMWV
12 - ACE
18 - 1 1/2-ton trailer
3 - Water trailer
12 - Wolverine
9 - Javelin
3 - MTV
3 - LMTV trailer
12 - Grizzly
12 - MICLIC
6 - M548
6 - Volcano
6 - HEMMT, cargo

Figure A-12. FXXI engineer battalion, heavy division

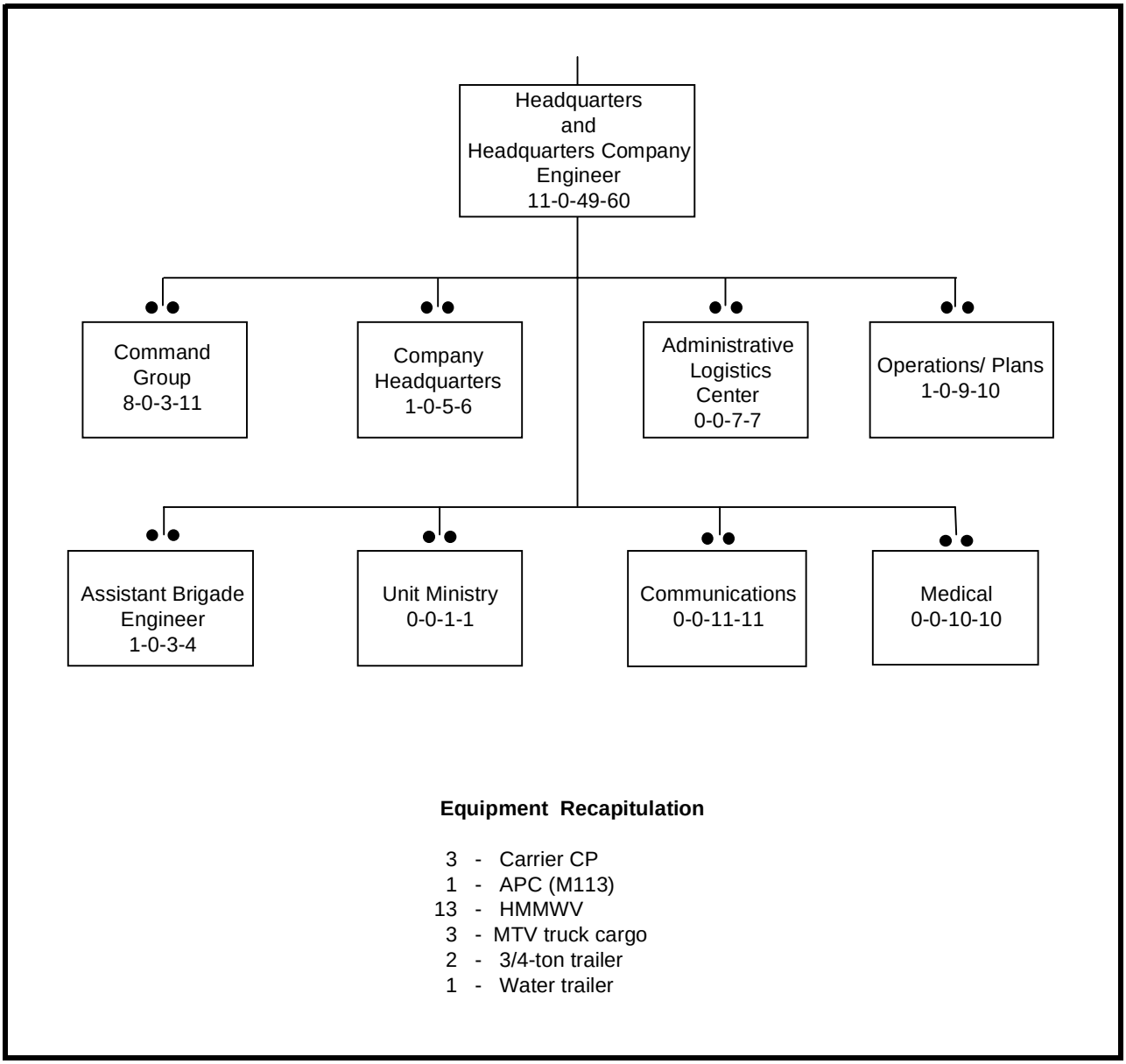
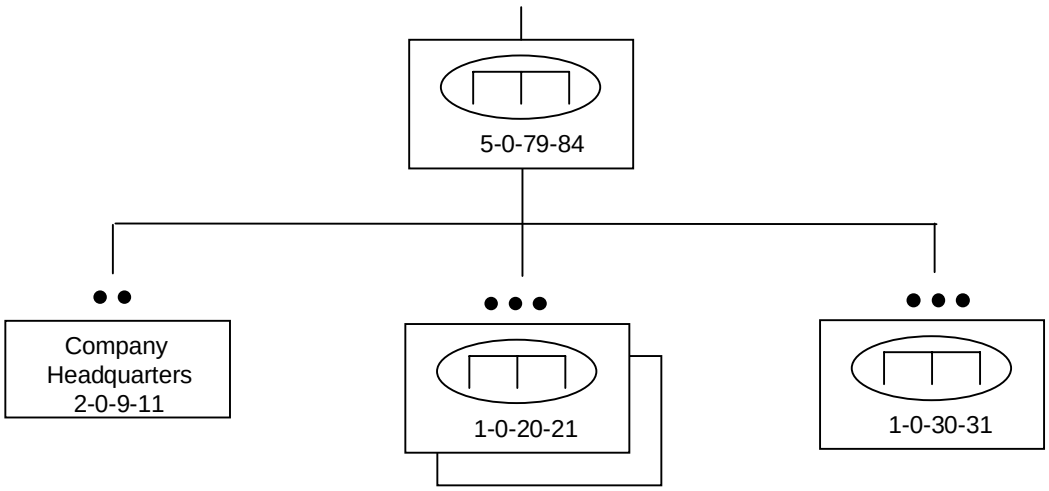


Figure A-13. FXXI HHC, engineer battalion, heavy division



Equipment Recapitulation

1 - APC (M113)
1 - HMMWV
1 - Water trailer
3 - Javelin
1 - 5-ton truck
1 - 2 1/2 ton truck

8 - APC
2 - HMMVW
4 - 1 1/2-ton trailer
4 - 2 1/2 ton trailer

4 - ACE
4 - 2 1/2-ton truck
4 - AVLB or Wolverine
4 - Grizzly
2 - HMMWV
4 - MICLIC

Figure A-14. FXXI engineer company, heavy division

APPENDIX B

C^2 Facilities

This appendix provides examples of how to lay out the engineer battalion C^2 facilities, including the Force XXI ABCS components. The battalion C^2 layout is influenced by its mission in support of the maneuver brigade.

MAIN CP

The engineer battalion either colocates with the maneuver brigade or establishes a separate CP (see *Figures B-1 and B-2, page B-2*). The functions of the main CP include maintaining SA of the current mobility, countermobility, and survivability (M/CM/S) situation throughout the maneuver brigade battle space. The main CP also serves as the planning cell for the engineer battalion orders production and for input into the brigade planning process for all future operations.

The Force XXI engineer battalion normally locates at or near the maneuver brigade's main CP as shown in *Figure B-3, page B-3*. In both C^2 layouts, the battalion XO is the OIC of the engineer main CP. The S3 and ABE are located in the brigade plans cell (when the S3 is not forward in the tactical CP). *Table B-1, page B-3,* shows the main CP shift schedule.

The engineer battalion is equipped to lay out an independent main CP as shown in *Figure B-4, page B-4*. In this layout, the ABE vehicle relocates from the brigade plans cell to the brigade main CP where the ABE section maintains SA of the M/CM/S operations for the maneuver brigade commander (See *Figure B-5, page B-4*). The ABE retains responsibility for integrating engineer operations into the planning of future brigade operations.

TACTICAL CP

The engineer battalion forms a tactical CP for forward C^2 parallel with the maneuver brigade. The battalion uses an M1068 armored command post as the TAC CP as shown in *Figure B-6, page B-5*.

The FXXI maneuver brigade commander is equipped to C^2 forward from a Bradley Fighting Vehicle (BFV) or in the C2V at the tactical CP. The engineer battalion is equipped to C^2 forward by moving in an M113 forward to the tactical CP (in parallel with the brigade commander's repositioning).

The engineer tactical CP is equipped with the MCS-ENG to maintain SA and a relevant common picture across the brigade battle space. The maneuver brigade TAC is equipped with both MCS and AFATDS.

REAR CP/ADMINISTRATIVE LOGISTICS OPERATIONS CENTER (ALOC)

In the FXXI engineer battalion, the rear CP is replaced by an element called the ALOC. It is usually located forward in the ESA as shown in *Figure B-7, page B-5*. This facilitates the ALOC's coordination with the ESE as it supports the engineer battalion. The engineer battalion S1/S4 is located in the ALOC and maintains constant contact with the engineer battalion HQ through MCS-ENG or voice systems. The ALOC personnel use the CSSCS to

transmit logistics status to the BDE ALOC and the FSB.

The alternate engineer ALOC layout is to colocate with the brigade ALOC (see *Figure B-8, page B-6*.) This is necessary when the engineer S6 vehicle moves forward to the main CP, because the ALOC does not have a means to transmit digital information from its ATCCS. *Table B-2, page B-6* shows the ALOC shift schedule.

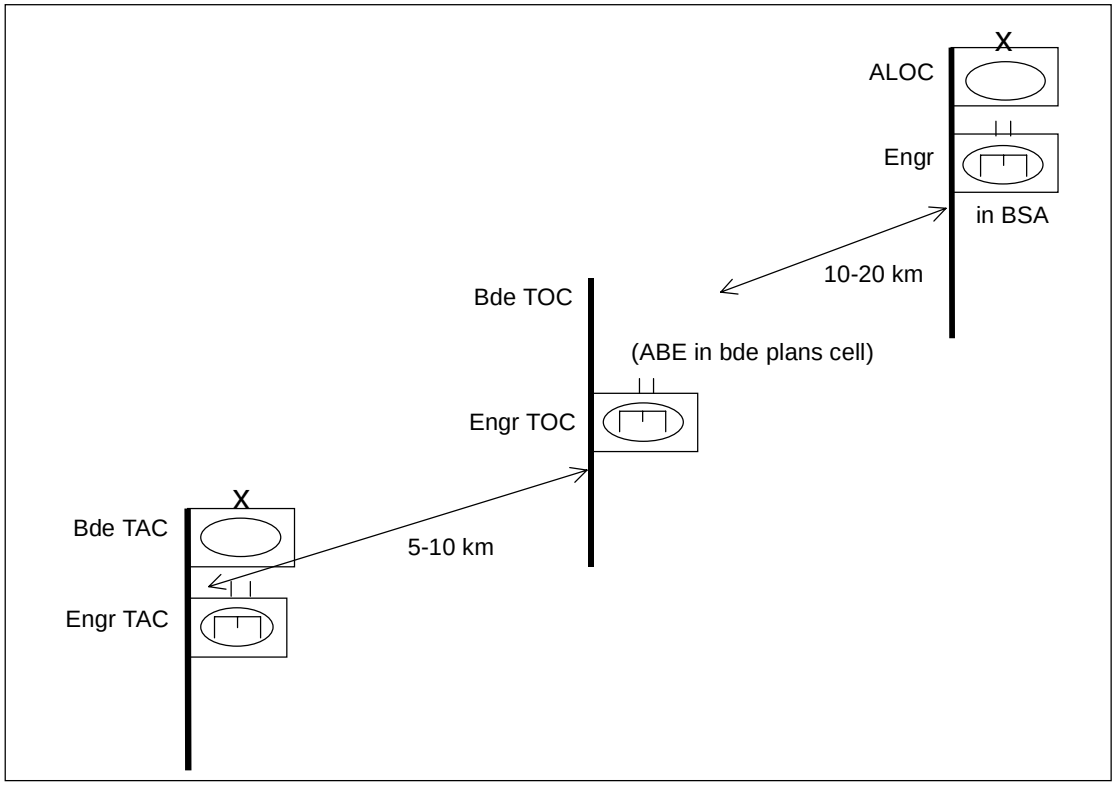


Figure B-1. Engineer battalion C^2 facilities with engineer TOC colocated with the brigade TOC

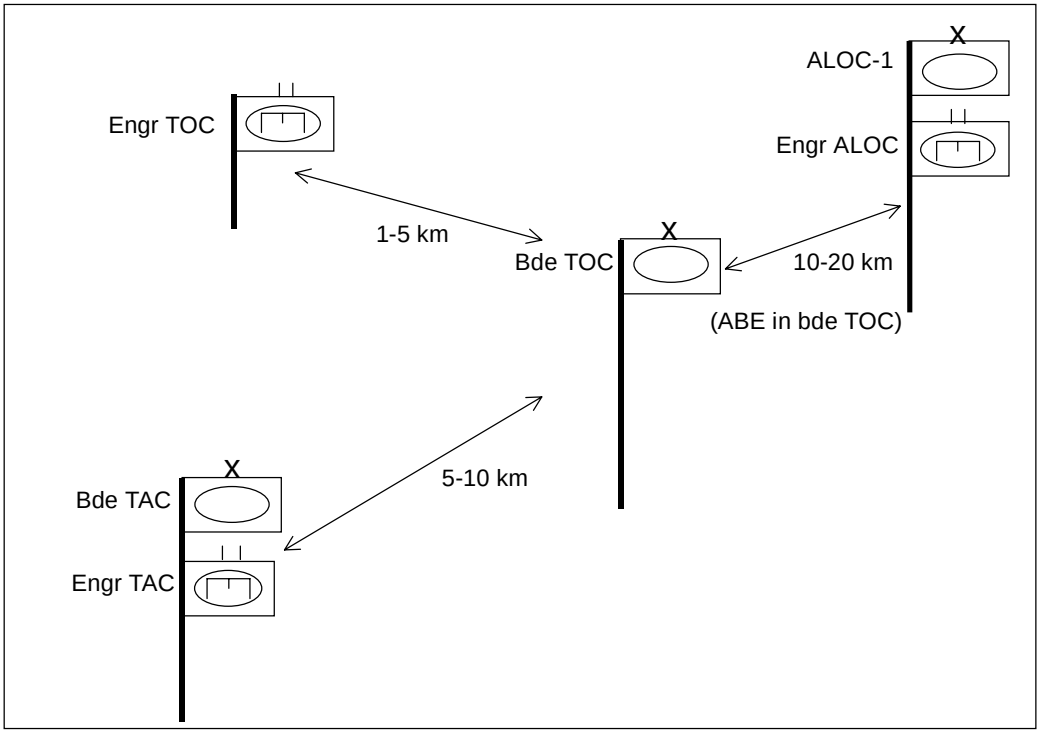


Figure B-2. Engineer battalion C2 facilities with engineer TOC not colocated with the brigade TOC

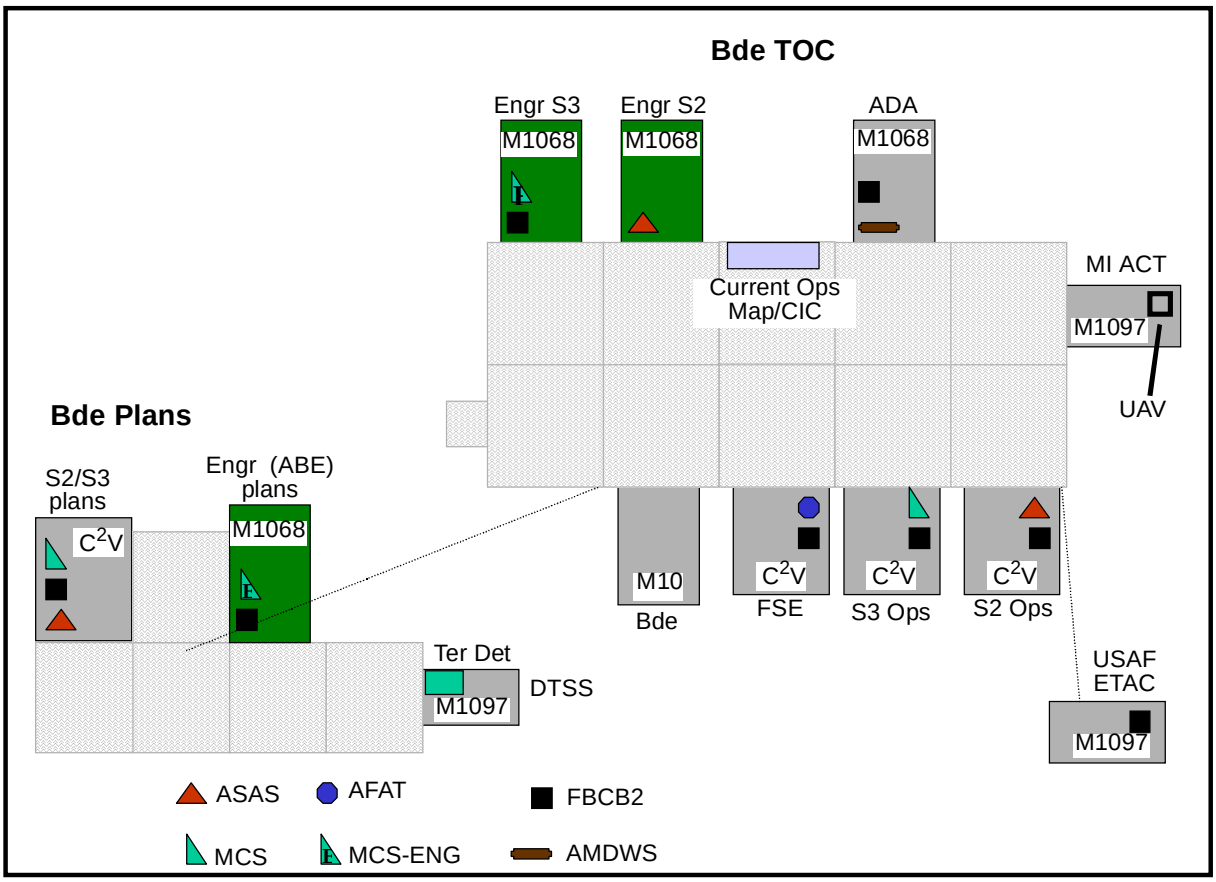


Figure B-3. Engineer battalion TOC colocated with brigade TOC

Table B-1. Main CP shift schedule

Shift 1	Shift 2
Operations officer	Operations officer
Construction sergeant	Reconnaissance sergeant
Two junior enlisted	Two junior enlisted

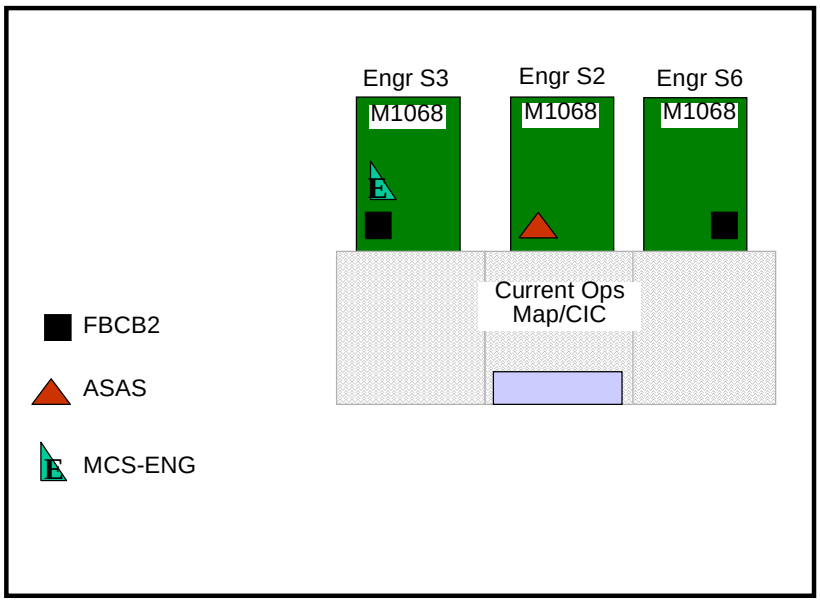


Figure B-4. Engineer battalion TOC when not colocated with the brigade TOC

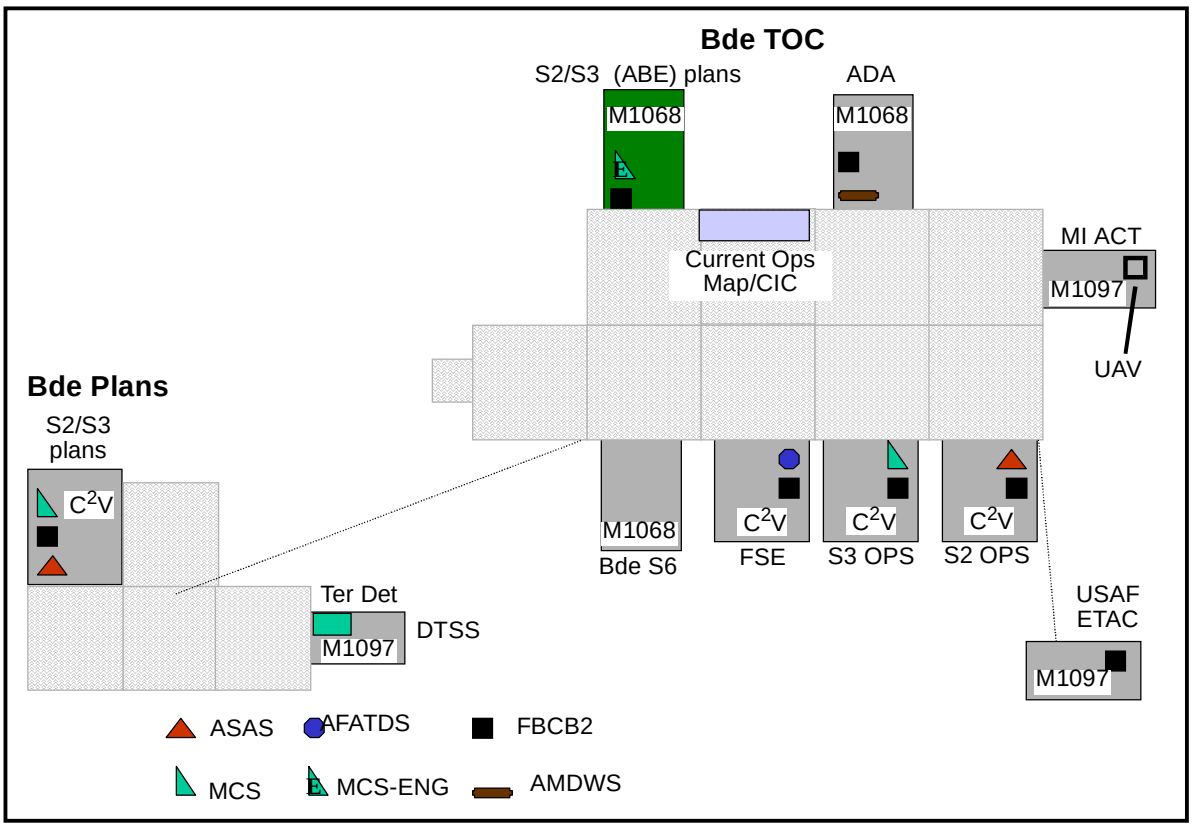


Figure B-5. ABE colocated with brigade TOC (separate engineer battalion TOC)

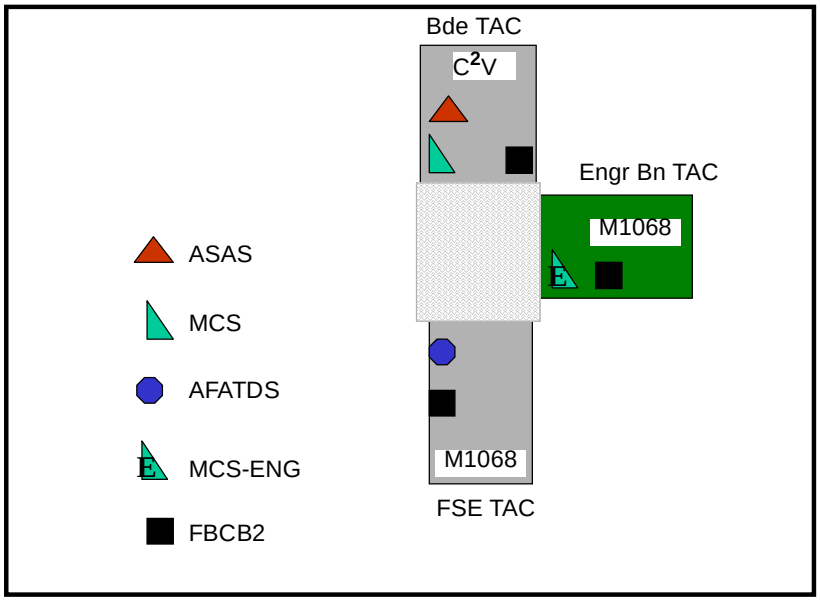


Figure B-6. Engineer battalion tactical CP (same in both C^2 layouts)

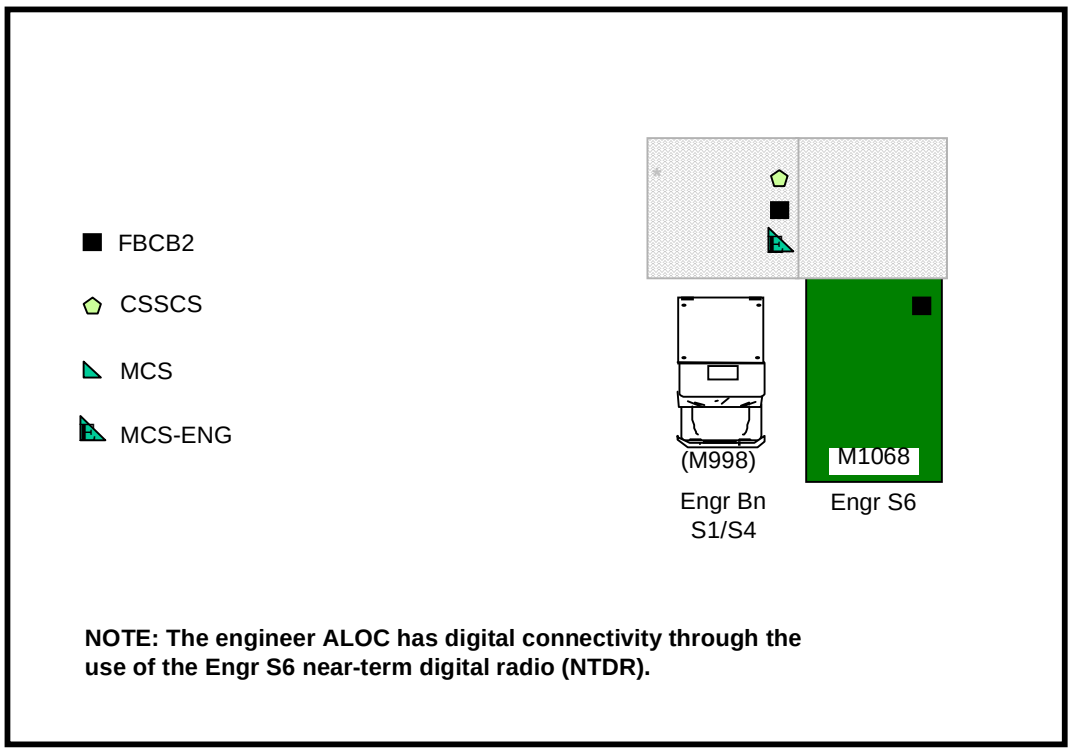


Figure B-7. Engineer battalion ALOC forward in the ESA

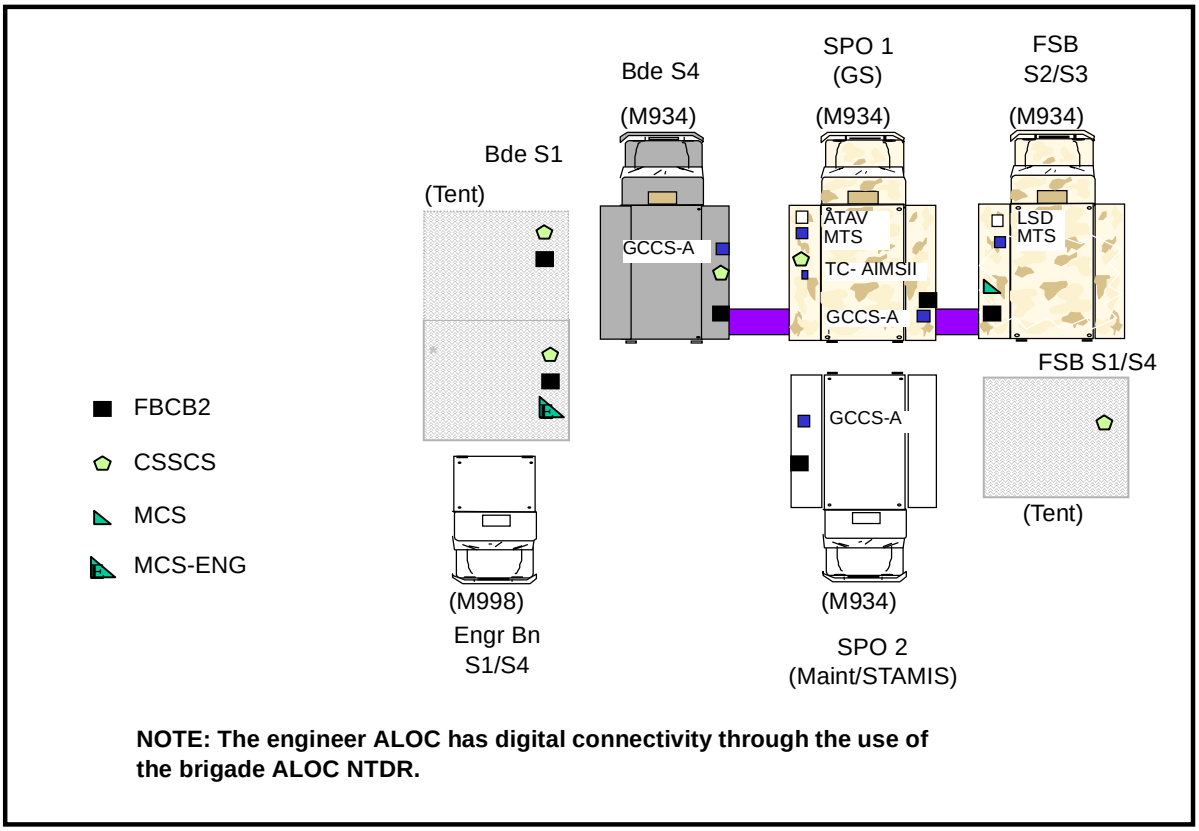


Figure B-8. Engineer battalion ALOC colocated with the brigade ALOC (in BSA)

Table B-2. ALOC shift schedule

Shift 1	Shift 2
S1	S4
S1 NCOIC	S4 NCOIC
Two junior enlisted	Two junior enlisted

APPENDIX C

Engineer Digital Systems

The systems included in this appendix are those that directly impact FXXI battalion engineer planning and operations. The systems described below, Raptor ICO and MCS-ENG, are not currently available for the heavy and light forces. These systems, in various stages of development, are planned for fielding in the near future. They are included in this appendix to provide a baseline understanding of their capabilities and to assist in maintaining continuity of lessons learned during Task Force XXI (TFXXI) and the DAWE. This information is also included to support training in a nonfield environment (such as simulation exercises) as concepts for employment evolve.

Other FXXI engineer systems, not discussed in detail in this appendix, are listed in *Table C-1*, with their respective reference manual.

Table C-1. Engineer systems and references

FXXI Systems	Field-Manual References
Land Warrior/DRS	FM 5-170, Appendix H
Grizzly	FM 20-32, Chapter 10, FM 90-13-1, Appendix C
ASTAMIDS	FM 20-32, Chapter 10
Wolverine	FM 90-13-1, Appendix C
DTSS	FM 5-105, Chapter 4
Hornet	FM 5-10, Chapter 3

TERRABASE II

TerraBase II is a computer software program that aids in terrain analysis and is compatible with most computer systems. It provides a way to integrate a wide variety of terrain data in a flexible manner using computer-screen images and hard-copy products. The FXXI engineers use TerraBase II as a supplement for DTSS and MCS-ENG, or alone when engineers do not have those systems. Samples of these products are shown in *Figures C-1 through C-6, pages C-3 through C-8*. These products enhance the brigade commander's ability to make informed battle space decisions. TerraBase II is most useful when employed in the brigade planning cell where the staff officers can analyze the effects of terrain on their particular battlefield function. Terrain products can be viewed while developing or analyzing COAs and can be digitally distributed, saved on a floppy disk, or printed to support subordinate units' planning.

The forms of data supported by TerraBase II are—

- Digital terrain-elevation data (DTED) level 1 and 2.
- Landsat thematic mapper data.
- Tactical terrain-analysis database (TTADB) factor overlays (the user inputs the data).

Additionally, point, area/linear (PAL) feature data that are taken from maps, aerial photos,

and other sources are used to produce a customized terrain analysis of operational areas. The end product is in the form of maps, digital overlays, and three-dimensional visual aids.

TerraBase II users, with a little training, can create line-of-sight (LOS) profiles; assess placement locations for weapons, radar, and radios; and view three-dimensional representations of the terrain. They may compute slope overlays, make user-specific analysis maps, classify and make maps with Landsat data, and obtain climate- and weather-related facts. In addition, the user may add digitized PAL features from photographs and/or maps to the database, as required by the mission. This database may be searched using limits that the user establishes to produce overlays or textural reports.

TerraBase II was originally designed to run on Zenith 248 computers and Epson-compatible Alps American printers. It can now run on any compatible 486 or Pentium computer.

TerraBase II supports the brigade's planning process with tailored topographic products. It provides terrain information to analyze the following:

- AO.
- Cover.
- Lines of communication (LOC).
- Helicopter landing zone/drop zone (HLZ/DZ).
- Intervisibility (IV) lines

Special or tailored products can also be produced to support the user. Examples are air-assault packets, target folders, infiltration routes to a specific objective, weapons placement, and river-crossing/ford sites. TerraBase II can also produce computer-generated products using the National Intelligence Mapping Agency's (NIMA) DTED, to include LOS profiles, placement/location of weapons systems, radar or radios, and three-dimensional representations of the terrain. The following describes the DTED products and what they can be used for analyzing terrain:

- LOS profile. This product is a direct LOS from point-to-point using a six-digit universal transverse mercator (UTM) grid coordinates for each point. It can be used to determine the LOS for radio, retrans, and radar sites (see *Figure C-2, page C-4*).
- Visible area plots (VAPs). This product shows an area "visible" from one location. The area can be thought of as LOSs radiating from the center of a circle. This can be a full 360 degrees or part of a circle (fan angle) from 10 degrees to 360 degrees. When developing this type of product, the user must provide a six-digit coordinate for the observer position, a six-digit coordinate for the target or observed position, a fan angle (10 degrees to 360 degrees), a map scale (1:250,000 - 1:12,500), and a description of the observer and target locations (for example, Hill 345 to the intersection of Highway 3 and Route 3052). Detachment personnel adjust the coordinates to get the best "visible" area possible. This product can be used for placement of listening posts/observation posts (LPs/OPs), weapons, antennas, special surveillance equipment or personnel, and possible enemy LPs/OPs (see *Figures C-3 and C-4, pages C-5 and C-6*).
- Oblique view. This product is a three-dimensional view of a piece of terrain. It can be enhanced with LOC, major rivers, major cities, and UTM grid ticks. The requester must provide a boundary using one of two methods. The first method is to use a six-digit coordinate for every turn in the boundary. The second method is to outline the boundary on a map or piece of acetate. This product is mainly used to give the commander and his staff a feel for the terrain in their AO (see *Figure C-5, page C-7*).
- Perspective view. This product is also a three-dimensional view that shows what people would see if they were actually

standing on the ground or hovering in a helicopter at a given location. The user must provide a six-digit coordinate for the observer location, a height of up to 1,500 meters (man size = 2 meters), and a six-digit coordinate of the target area to be observed (this can also be expressed as a cardinal direction in degrees). This product is used to show the commander and his staff the terrain of a specific area as seen from the ground (see *Figure C-6, page C-8).*

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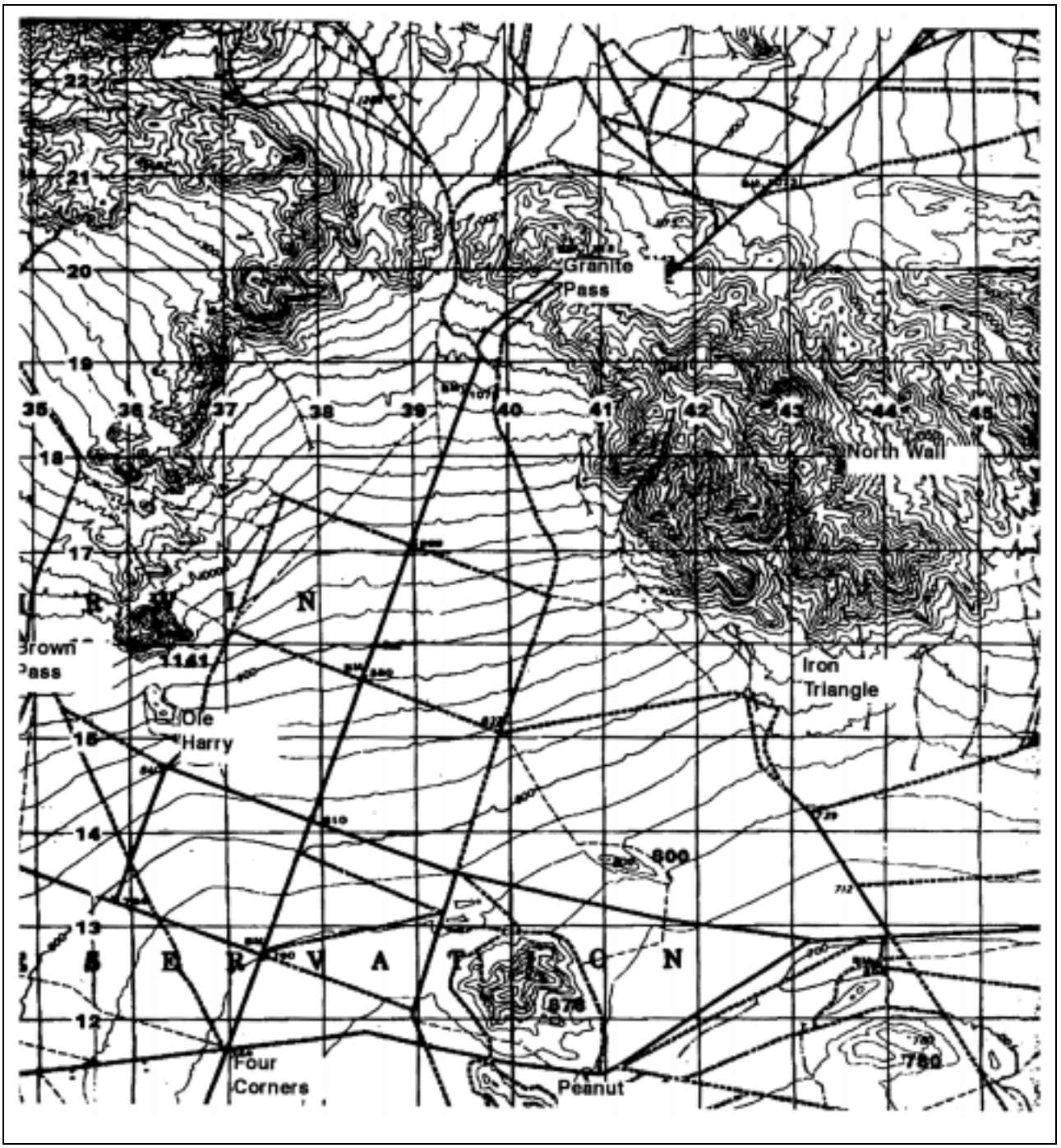


Figure C-1. Scanned image of the actual working area for all products shown in *Figures C-2 through C-5*

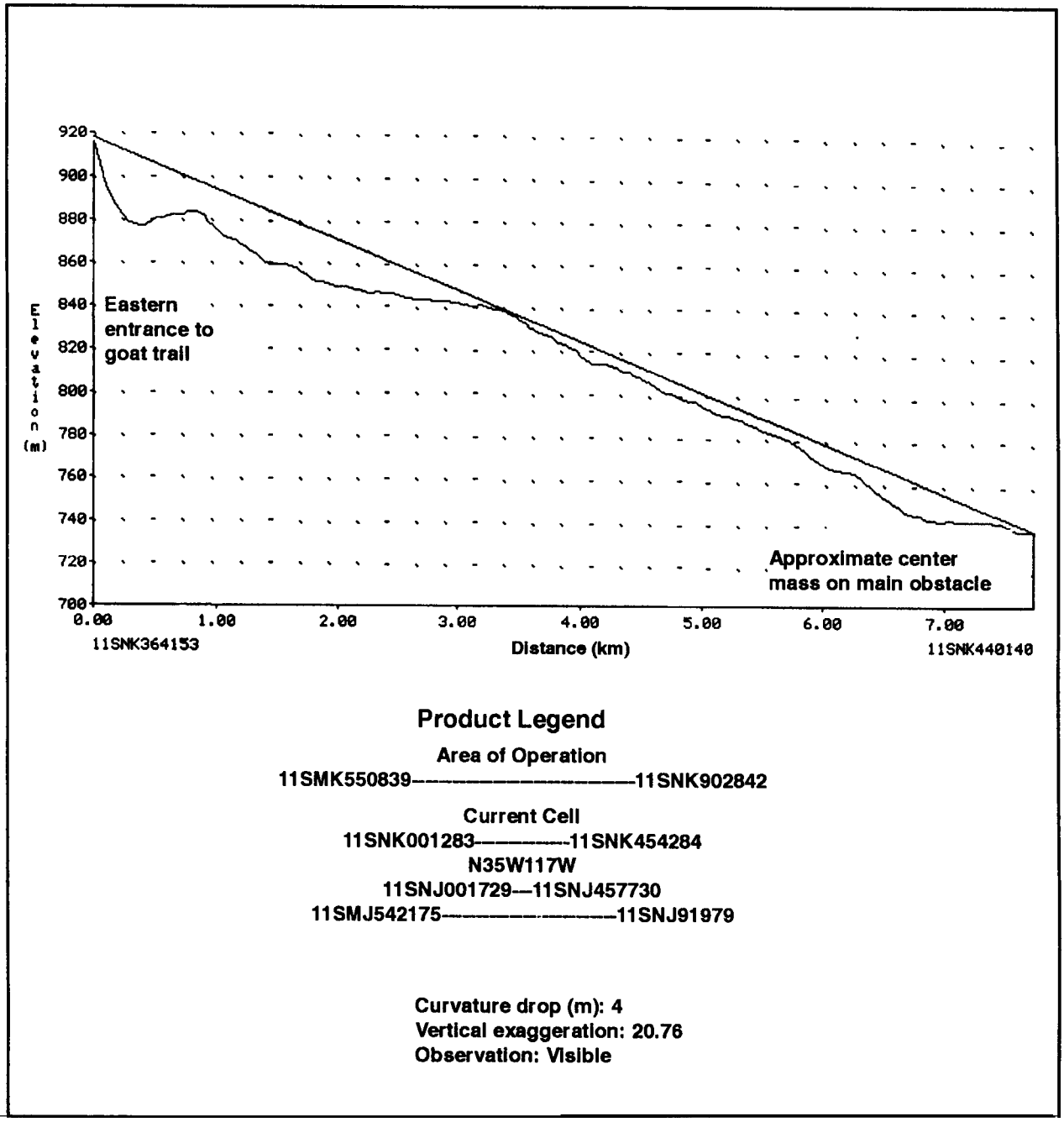


Figure C-2. LOS

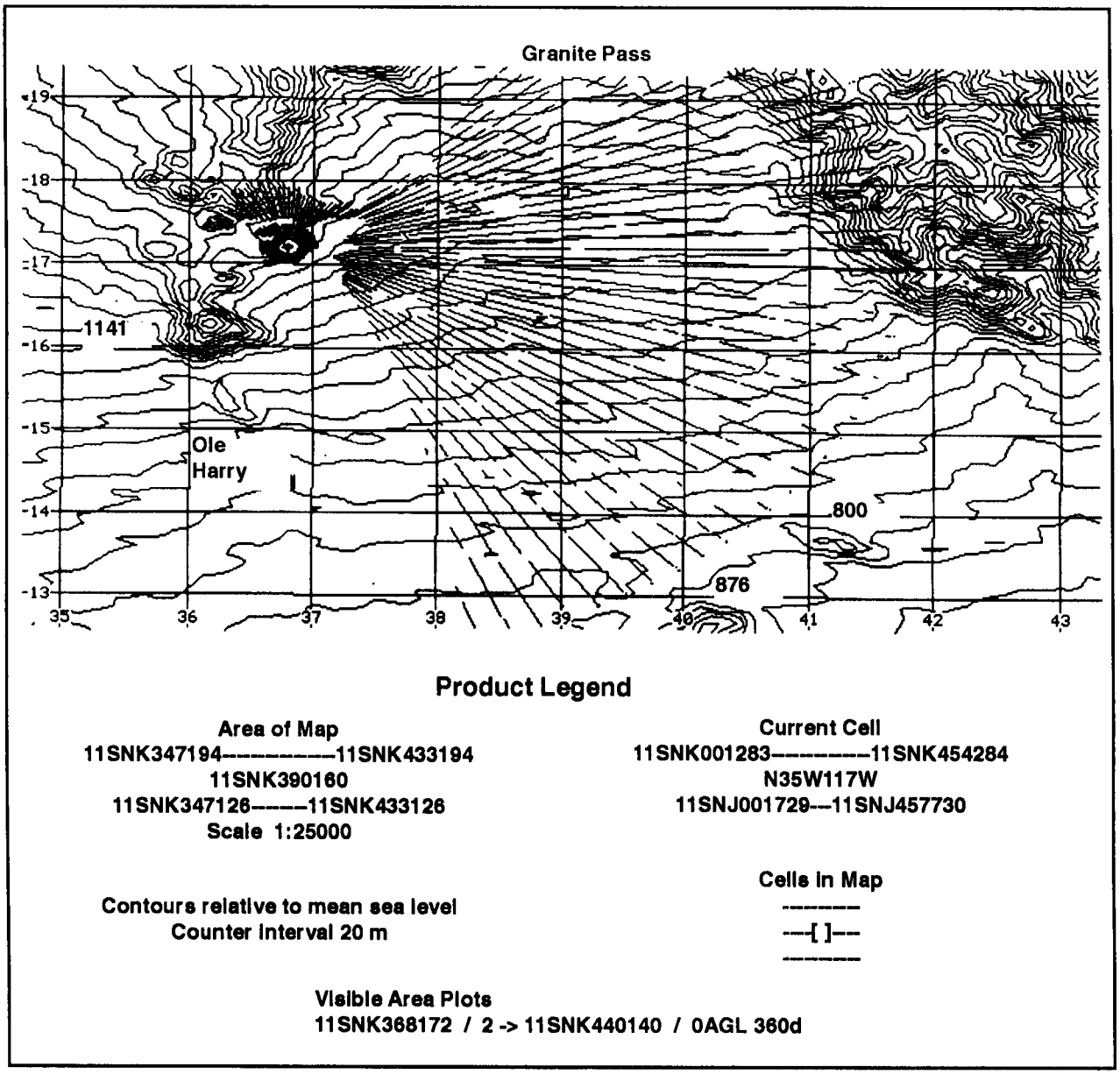


Figure C-3. VAP with UTM grids overlay

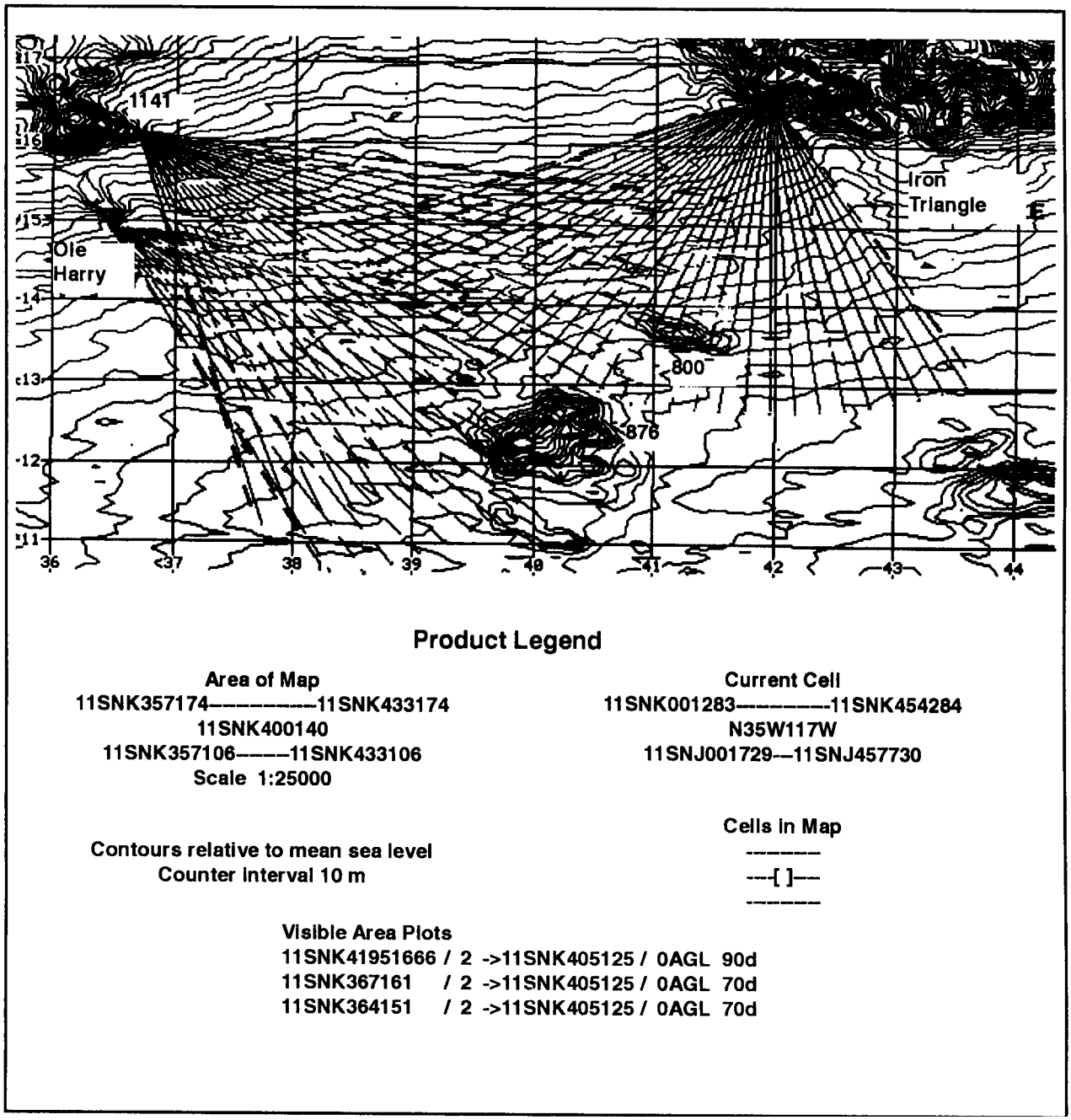


Figure C-4. VAPs

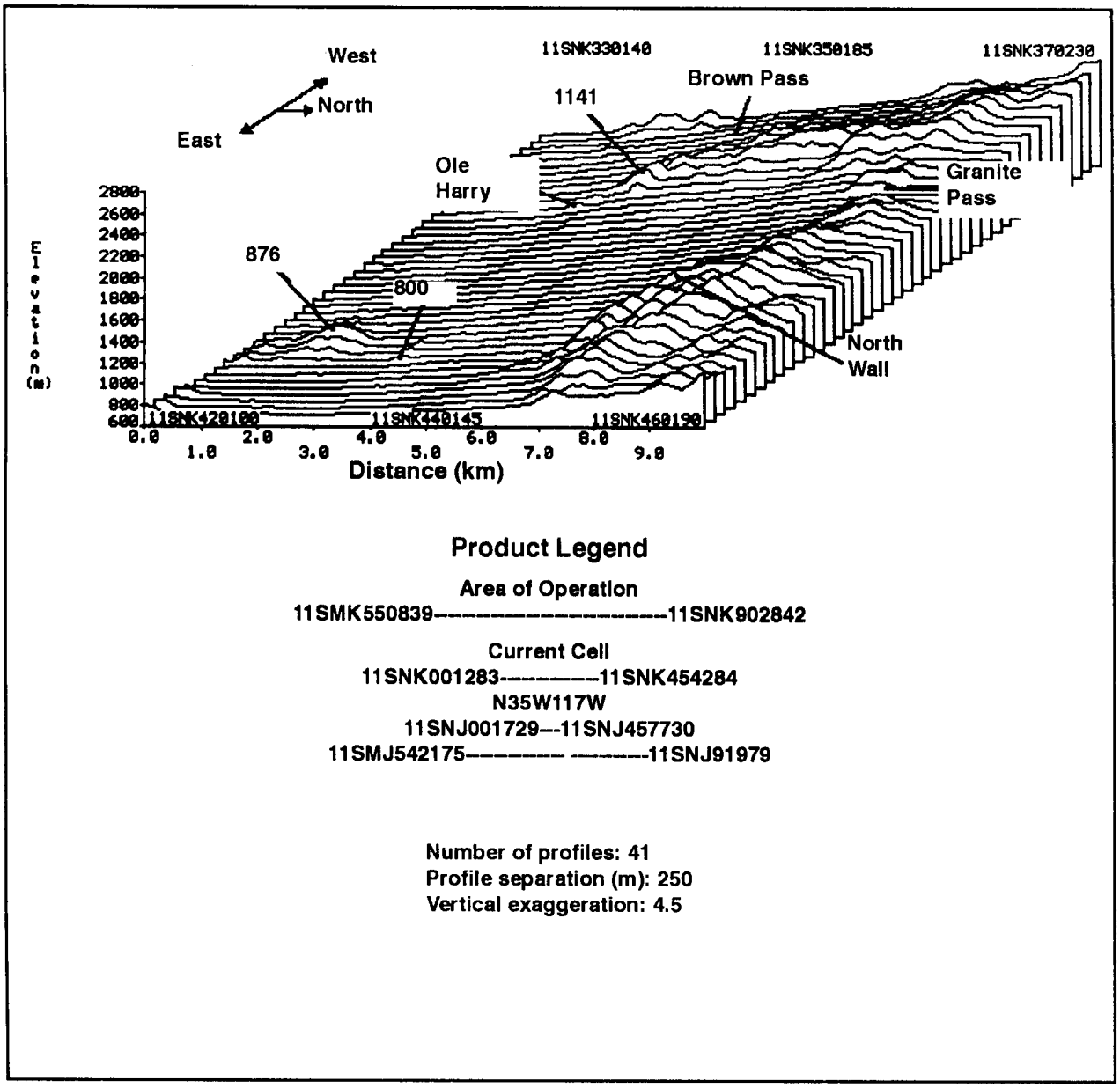


Figure C-5. Oblique view

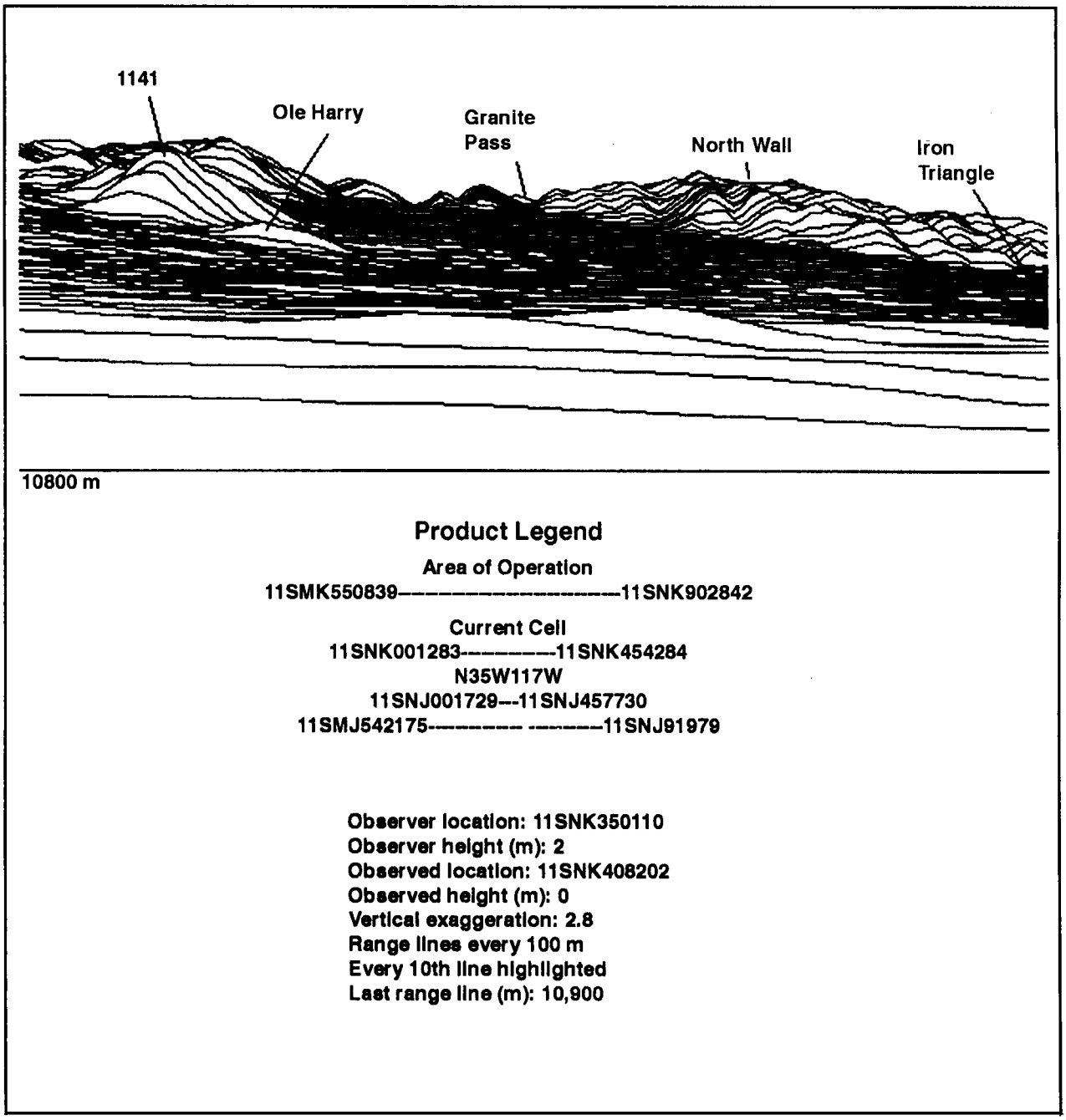


Figure C-6. Perspective view

MANEUVER CONTROL SYSTEM – ENGINEER

The MCS-ENG is an engineer-specific software system subordinate to the MCS. This software will reside on the MCS version 12.0+ software. The system provides an automated C^2 capability to engineer staffs and commanders. The MCS-ENG operates on the ATCCS common hardware. It provides the engineers the following capabilities:

- Engineer information to the MCS.
- Specific engineer planning and operations tools.
- Engineer access to interface with the DTSS terrain products.
- Linking with intelligence and maneuver data.

The MCS is a C^2 system, which provides the FXXI maneuver commander and his staff (corps down to separate maneuver brigades) with automated assistance to execute precise, near real-time C^2 of combat forces. Data is transferred electronically over the local area network (LAN)/wide area network (WAN), through available communications media, using MCS protocols to feed information down to the FBCB2 systems. Basic functions of the system include inputting, processing, and outputting data to support the MCS-ENG information requirements.

EMPLOYMENT CONCEPT

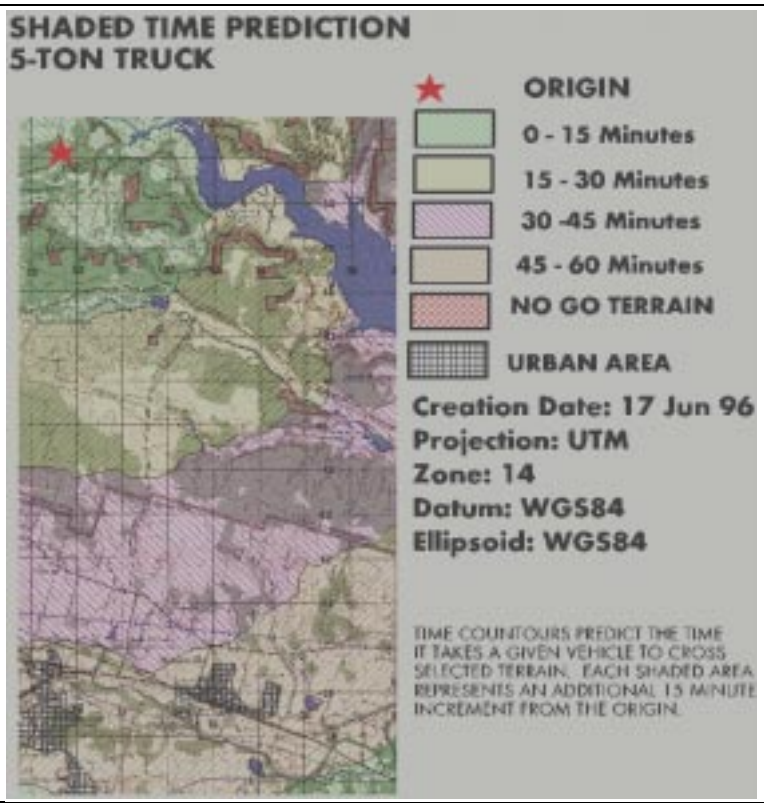
The FXXI engineer units that are organic to and/or supporting FXXI divisions and their maneuver brigades will receive the first fielded MCS-ENG. A downsized version of the MCS-ENG software will also be initially distributed to engineer companies supporting FXXI maneuver battalions to provide them a digital engineer reporting and C^2 capability. However, the downsized version of the software will be installed and operated on the FBCB2 instead of the MCS.

PLANNING CONSIDERATIONS

The MCS-ENG's functionality allows the engineers to develop detailed engineer plans and support the maneuver commander with the following capabilities:

- Operations, which includes—
  - Mobility, which includes—
  - Ground distance overlay.
  - Potential LOC.
  - Corridors.
- Countermobility, which includes—
  - Obstacle planner (analyzer).
  - Obstacle effects (ditches/berms, craters, Raptor ICO, and minefields).
- Survivability, which includes—
  - Planner (position excavation and weapons-effects calculations).
  - Construction (crew-served weapons, vehicle positions, and TOCs).
- Digital terrain data, which includes—
  - DTED I & II.
  - Interim terrain data (soil, slope, vegetation, transportation, drainage, and obstacles).
- Tactical decision aids, which includes—
  - Terrain data query (LOCs and data extraction).
  - Intervisibility (optical LOS, communications sitings, and weapons fans).

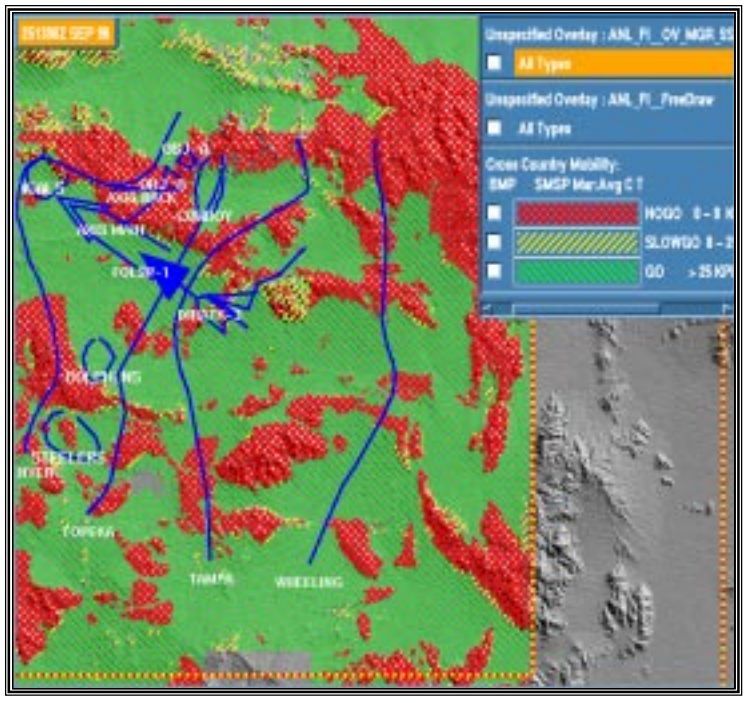
The MCS-ENG allows the FXXI battalion engineers to access DTSS products as well as terrain products from other ABCS computers. *Figures C-7 through C-10, pages C-10 through C-12,* provide examples of digital products available via the MCS-ENG to the FXXI engineer units.



Speed-over-terrain calculation for a 5-ton truck limiting factors include terrain slope, vegetation, soil condition, and vehicle-performance capabilities.

Source: Terrain analyst
Updates (normal): As needed

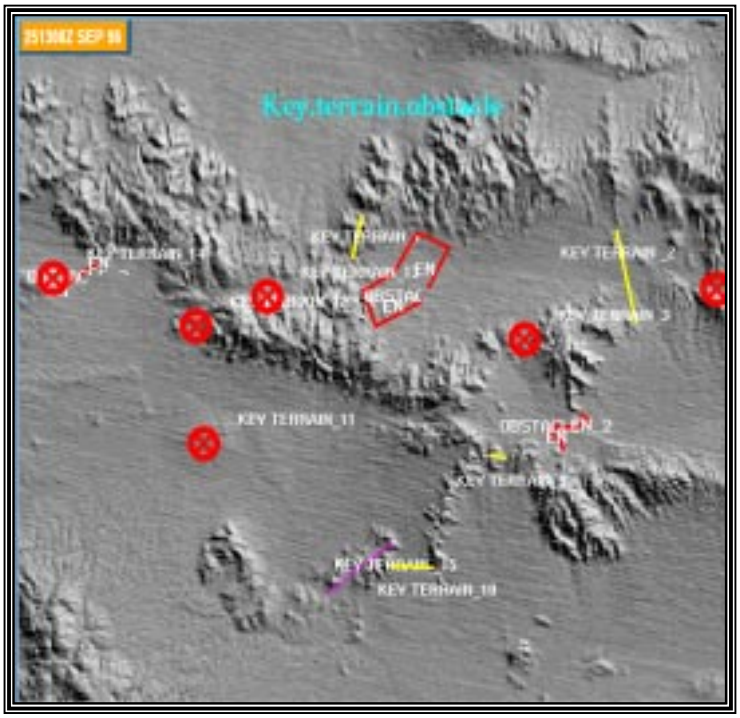
Figure C-7. Shaded time distance



The cross-country mobility overlay shows "GO/NO GO" areas tailored to vehicles by unit type

Source: Any ABCS
Updates (normal): As situation changes

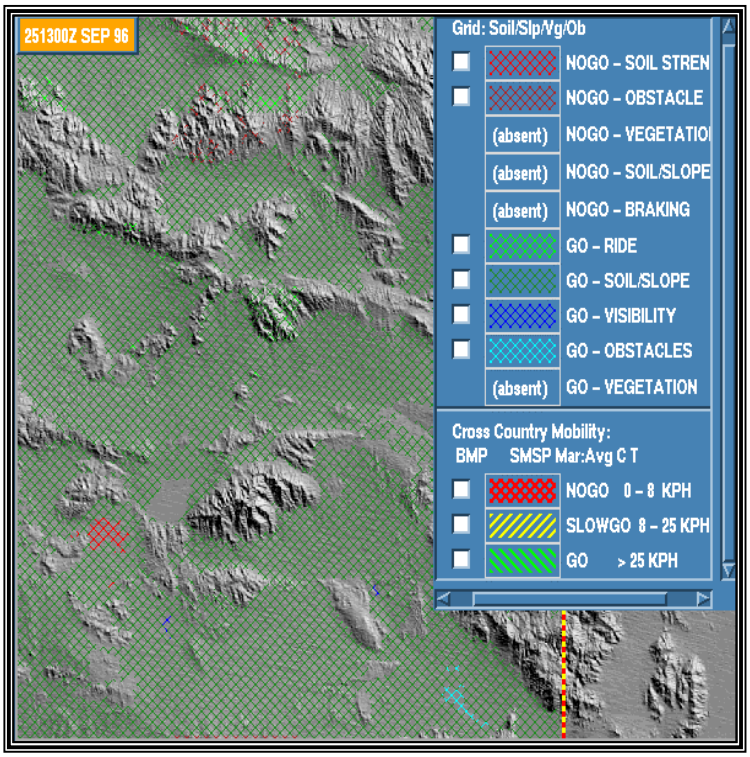
Figure C-8. Cross-country mobility overlay



Shows key terrain points and obstacles plotted on a relief map

Source: S2/engineer
Updates (normal): As required

Figure C-9. Key terrain overlay



Shows "GO/NO GO" areas based on soil/ obstacles elevation

Source: S2/engineer
Updates (normal): Based on weather or changes in AOI

Figure C-10. MCOO

RAPTOR ICO

The Raptor ICO is an emerging engineer system and concept that is designed to enhance the combat power of the FXXI Army. It is capable of providing detailed and highly accurate target-acquisition data. The Raptor ICO (originally part of the intelligence minefield initiative) also represents an evolutionary leap in the employment of obstacles on the modern battle space.

The system consists of two parts, the ICO sensor and communications subsystem and the Hornet wide area munition (WAM) with a computer-linked control (Gateway) subsystem.

Developed from the Hornet PIP, the Raptor ICO performs the following operations: it remotely senses and type-categorizes enemy vehicles, reports their status, coordinates covering fire, and engages the enemy as programmed or directed.

The Raptor ICO is also designed to provide the commander the ability to accept some tactical risk in unmanned areas. It provides him a system capable of sensing and destroying enemy vehicles or formations. This enables the commander to place unmanned combat OPs in key areas and along key routes to provide early warning and to interdict advancing HVTs. Raptor ICO also allows the commander to place unmanned lethal systems in areas identified as potential enemy staging or assembly areas. Using these areas as decision points, the commander can employ the Raptor sensors in conjuction with its Hornet munitions to monitor enemy actions simultaneously, and trigger its attack in conjuction with covering fires.

The Raptor ICO is to be the first of several ICO systems fielded to FXXI units. It is being integrated into the ABCS and Army common hardware. It has evolved from the standard conventional mine that, once emplaced, had no on-off capability. *Figure C-11* illustrates the evolution of the mine from the M-15 to the Raptor ICO.

CAPABILITIES

The Raptor intelligent combat outpost detects, classifies, and engages heavy and light tracked and wheeled vehicles. It is a hand-emplaced tactical obstacle which consists of Hornet-PIP munitions, gateways (local Hornet-PIP attack coordinators), and advanced acoustic sensors (AAS).

The Raptor introduces an entirely new concept to the combined-arms team. Whether the Raptor uses the hand-emplaced-wide area munitions (HE-WAM) PIP (also known as Hornet-PIP) or another system, it type-categorizes enemy vehicles, reports, and then engages on those vehicles (*see Figure C-11.*) It can be ordered or programmed to develop coordinated attacks with other minefields and/or direct- and indirect-fire weapons. The Raptor can be inactivated, allowing freedom of maneuver through (lane) the obstacle while still providing near-real-time intelligence and SA. The Raptor has standoff detection and engagement capabilities. It attacks from the side or top at ranges up to 100 meters.

The Raptor intelligence combat outpost is a reinforcing, tactical obstacle that, when properly integrated, attacks enemy maneuver and multiplies the effects and capabilities of firepower. It—

- Can be used as a stand-alone tactical obstacle or synchronized with other conventional obstacles.
- Will disrupt and delay the enemy, allowing long-range, precision weapons to engage more effectively. This feature is particularly effective in non-LOS engagements.
- Will be able to communicate with its employing unit for remote on/off/on or programmed capability, reporting battle-space intelligence. The battle-space intelligence data may include target descriptions, numbers, and the

direction and rate of movement. It could also provide an early warning of the enemy's activity.

- Can communicate with other munitions for conducting coordinated attacks.

The Hornet PIP is a subset of the Raptor and is the first of several systems fielded to Force XXI. The Raptor will be integrated into the ABCS and the Army common hardware (ACH).

When properly integrated, the Raptor has the capability of being employed as either a directed or situational tactical obstacle. Some examples of situational employment include early disruption of moving enemy forces, covering CATK routes, and providing flank security. When employed in these capacities, the on/off/on or preprogrammed capability maintains the obstacle effect but does not hamper the maneuver commander's flexibility.

EMPLOYMENT CONCEPT

Combat engineers, maneuver forces, and/or remote vehicles under engineer supervision and at extended ranges by special operations forces and rangers, will emplace the Hornet-PIP, the gateway, and the AAS in the battle space. They will be employed through the entire depth of the battle space to support Army operations. In the MBA, they can be used to fix the enemy and weaken him along his AA. The Hornet-PIP with the AAS and Gateway can be emplaced as an offensive-support weapon system because of its quick emplacement time and area denial capability. It can be employed rapidly along exposed flanks during a maneuver as a situational obstacle to disrupt the enemy's CATKs.

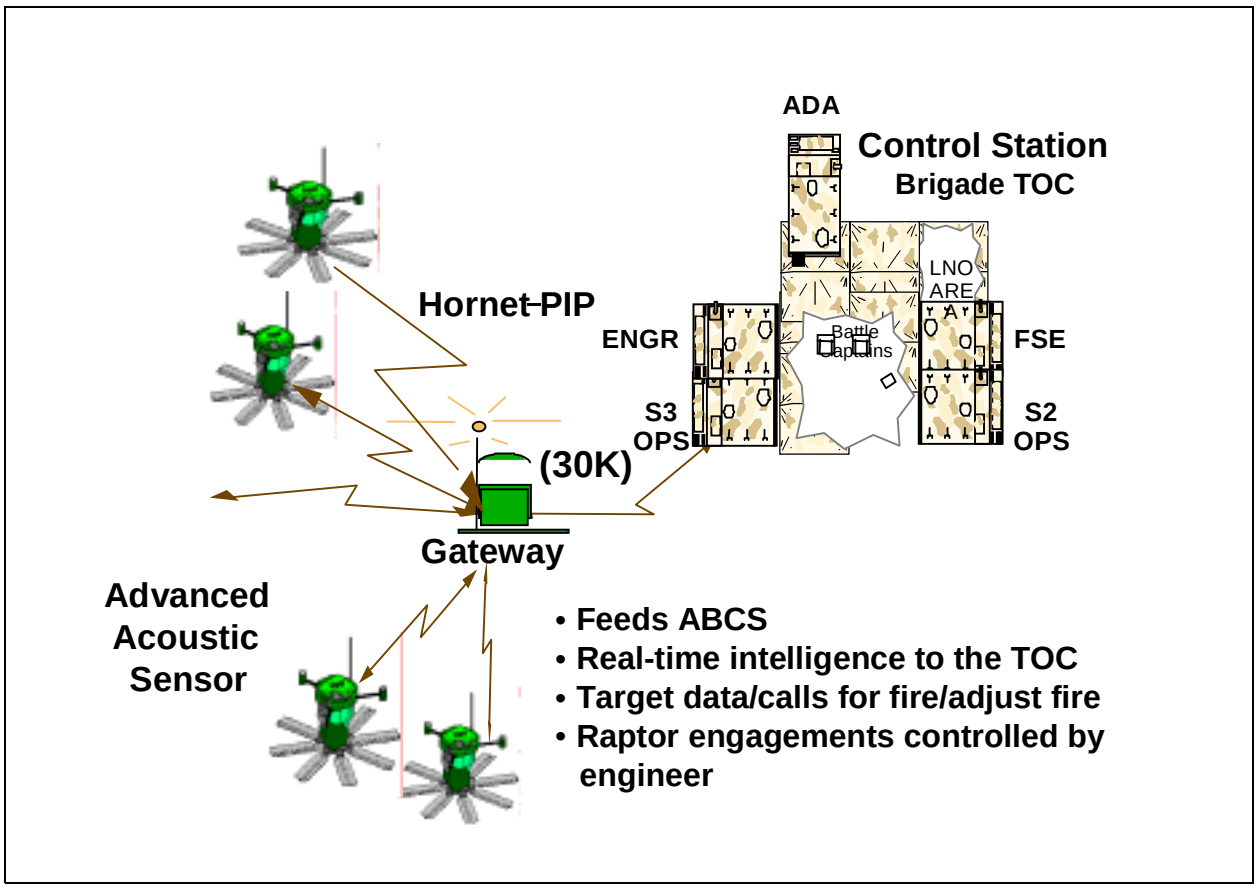


Figure C-11. RAPTOR intelligent combat

In the deep fight, the Raptor can provide real-time intelligence in support of the R&S effort. The Hornet-PIP with the AAS and gateway can be used at the enemy's decision points to provide an early warning of enemy intentions or to influence the enemy to a particular COA through coordinated Hornet-PIP and precision-munitions attack designed to disrupt his movement.

Figure C-12 demonstrates how the Raptor ICO can be used in an encomy-of-force role. *Figure C-13, page C-16,* demonstrates how the engineer employs the Raptor ICO to support deep operations. Engineer squads airmobile 50 kilometers forward of the FLOT to conduct "Raptor raids" or emplace Raptor ICOs deep. Raptors are used at decision points to provide early warning of enemy intentions or to influence the enemy to take a particular COA through coordinated Hornet PIP and precision-munitions attack to disrupt enemy movement. Deep operations require detailed BOS coordination and synchronization. *Figure C-14, page C-17,* shows how the maneuver commander can incorporate the Raptor ICO into a combined-arms trap. *Figure C-15, page C-17* shows the connectivity and synchronization that occurs to integrate Raptor ICO into direct- and indirect-fire engagements. *Figure C-16, page C-18,* shows the use of Hornet and acoustical sensors employed as a disrupt obstacle in an X-pattern. *Figure C-19, page C-20,* shows the Hornet and acoustical sensors when employed in a gauntlet pattern. This pattern is effective in constrictive terrain along the enemy's AA.

PLANNING CONSIDERATIONS

Hornet-PIP and Raptor-ICO munitions are employed in the same configurations. The following examples provide reference for planning their emplacement requirements. Because Hornet PIP can be manually armed by a soldier, a planning consideration is to ensure that all personnel move a safe distance, 500 meters, within 5 minutes of arming. This prevents the Hornet PIP from accidentally engaging the emplacing unit during obstacle construction.

The most effective methods of employment for Hornet PIP and Raptor ICO is the X-pattern (see *Figure C-16, page C-18)* and the gauntlet pattern (*Figure C-17, page C-19*).

Hornet-PIP WAM munitions should be integrated with other types of obstacles whenever possible. *Figure C-18, page C-20* shows the use of Volcano minefields to achieve turning, blocking, disrupting, and fixing effects across the battle space.

DIGITAL TOPOGRAPHIC SUPPORT SYSTEM/QUICK-RESPONSE MULTICOLOR PRINTER (QRMP)

The DTSS/QRMP is a mobile automated terrain-analysis system that supports battle space operations at all tactical and operational echelons from brigade through theater. This system, at each level, provides digital terrain data (DTD) graphics to all ABCS users. At the division, the DTSS's cells are located at the maneuver brigades with engineer elements of supporting engineer battalions and at the FXXI division tactical CP (DTAC) and division main CP (DMAIN) mobility (MOB) cells. Each DTSS cell can provide the ATCCS, digitized maps, terrain studies, photography, climatic summaries, weather forecasts and reports, and other DTED database information.

The QRMP provides the capability to produce hard-copy products as well. Linked through the defense information system network (DISN), it accesses information from reconnaissance-equipped GPS sensor surveys and NIMA downlinks. This provides a geographic information system to answer questions regarding terrain, mobility, bridges, and other geographic features using tables, maps, image files, and other products.

Situation:
The enemy's combined-arms army (CAA) is moving west. A FXXI division conducts an attack to destroy an enemy's tank division.

1 The UAV identifies the main attack. The Raptor-ICO fields are emplaced on likely avenues of approach.

2 The Raptor ICOs and UAVs identify the enemy's main axis of advance for the division.

3 Brigade assets and Raptor-ICO fields protect the division's flanks by tracking the enemy's motorized rifle division (MRD).

4 The Raptor ICOs trigger attack aviation. Attack aviation conducts an attack on the northern MRD.

5 The Raptor ICOs trigger an airmobile attack on the southern enemy division. The division's maneuver brigade completes the destruction.

End State: The division attack neutralizes two enemy divisions.

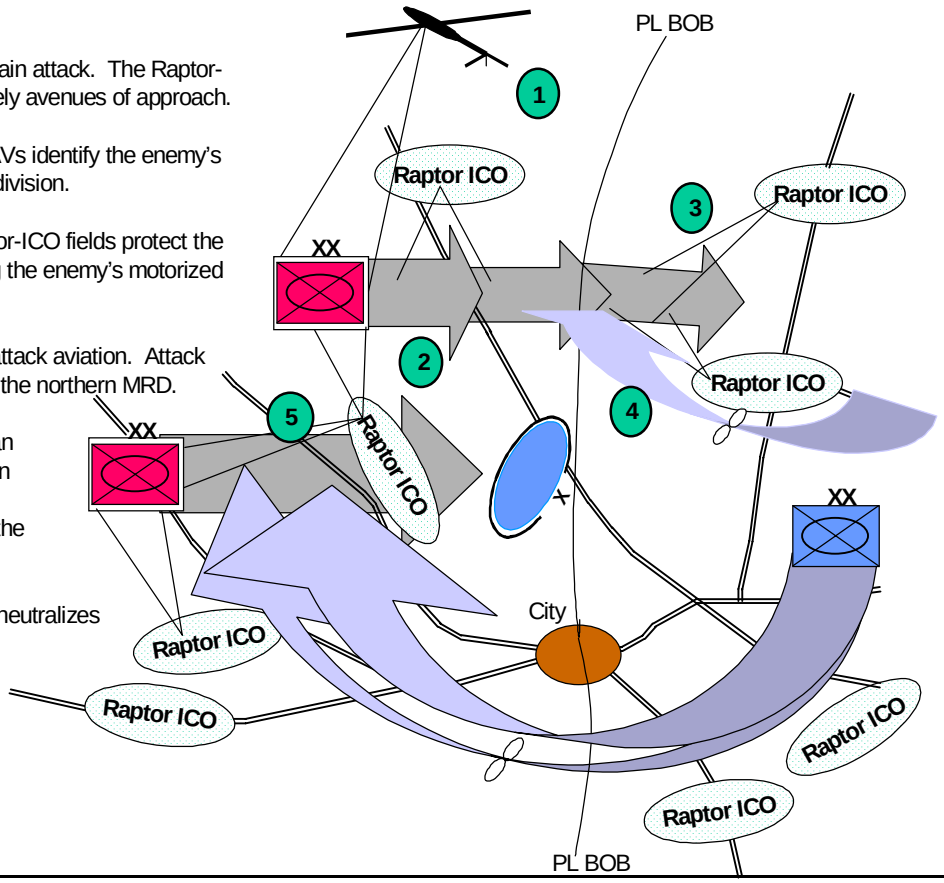


Figure C-12. Raptor ICO in an economy-of-force role

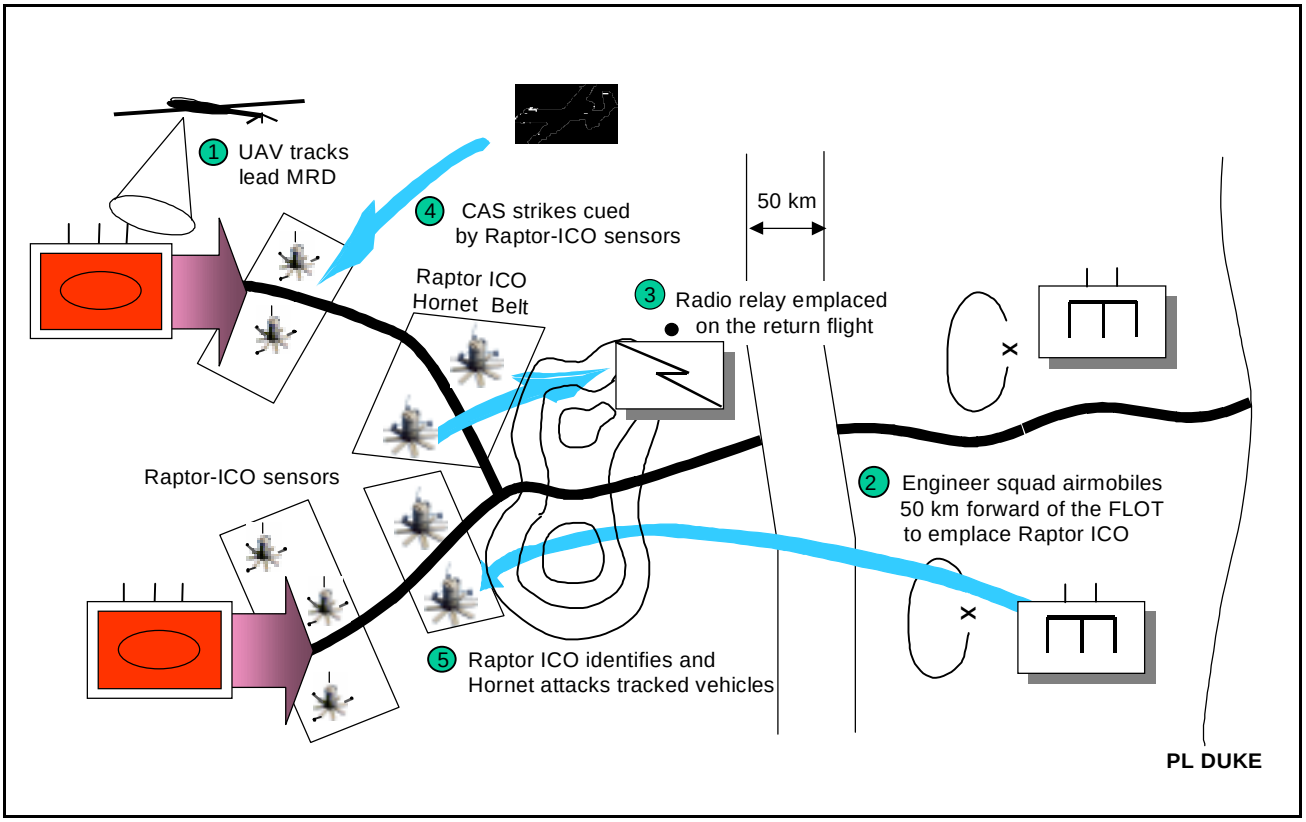


Figure C-13. Engineers conduct "Raptor raids" in support of deep operations

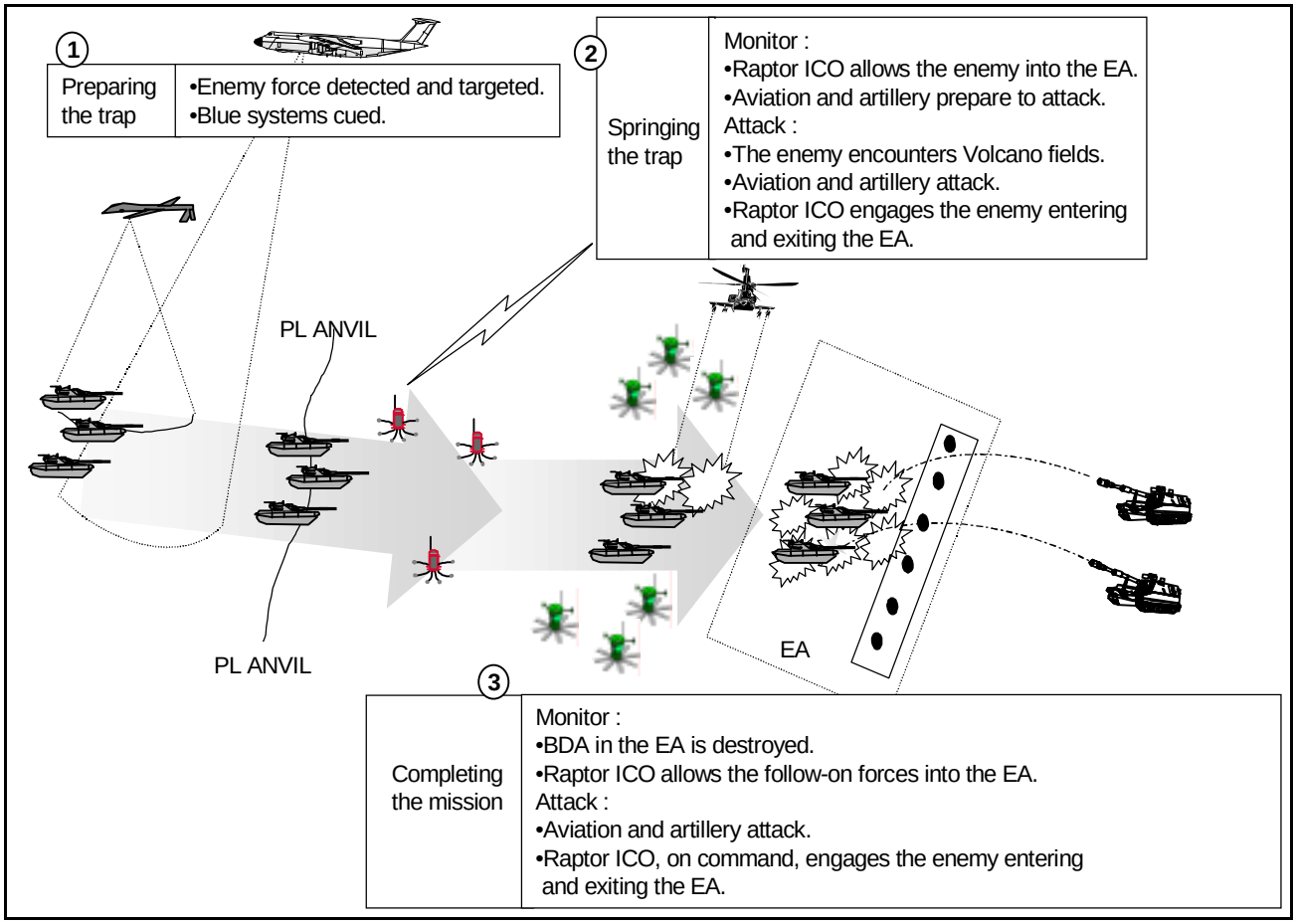


Figure C-14. Raptor ICO used in a combined-arms trap

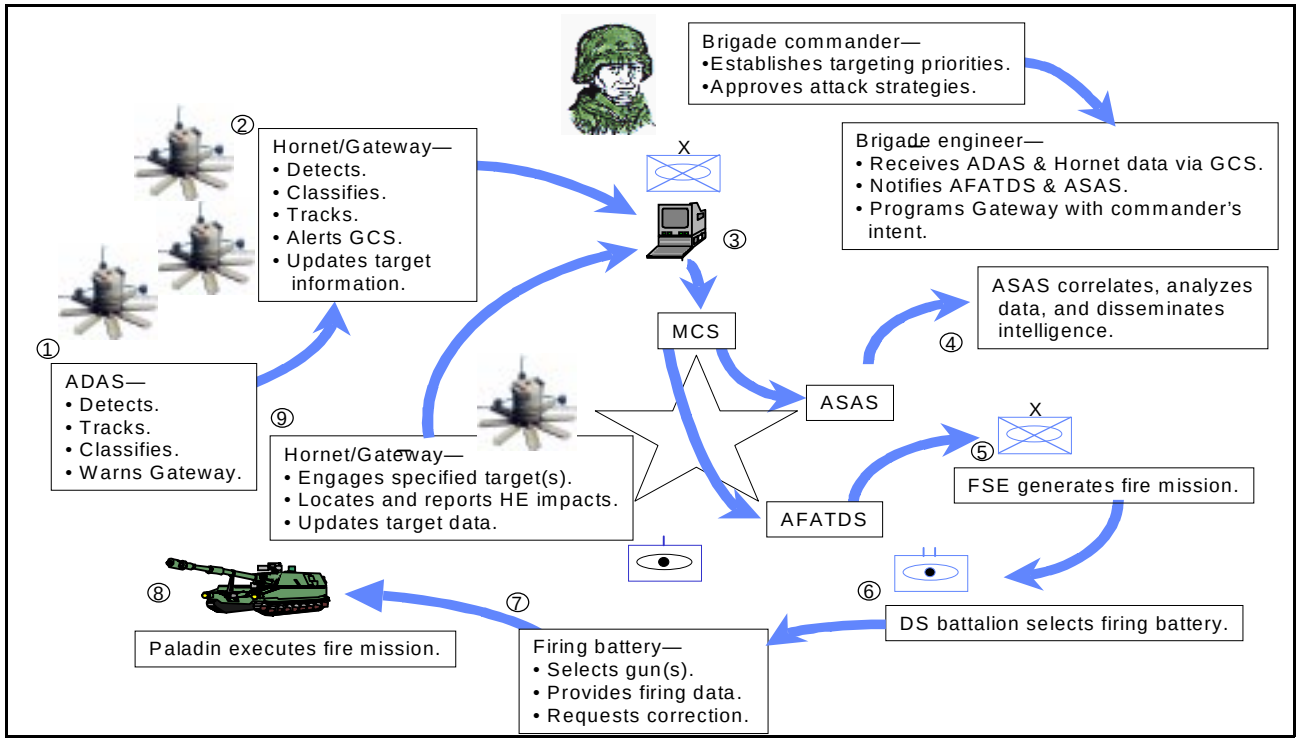


Figure C-15. Connectivity and synchronization

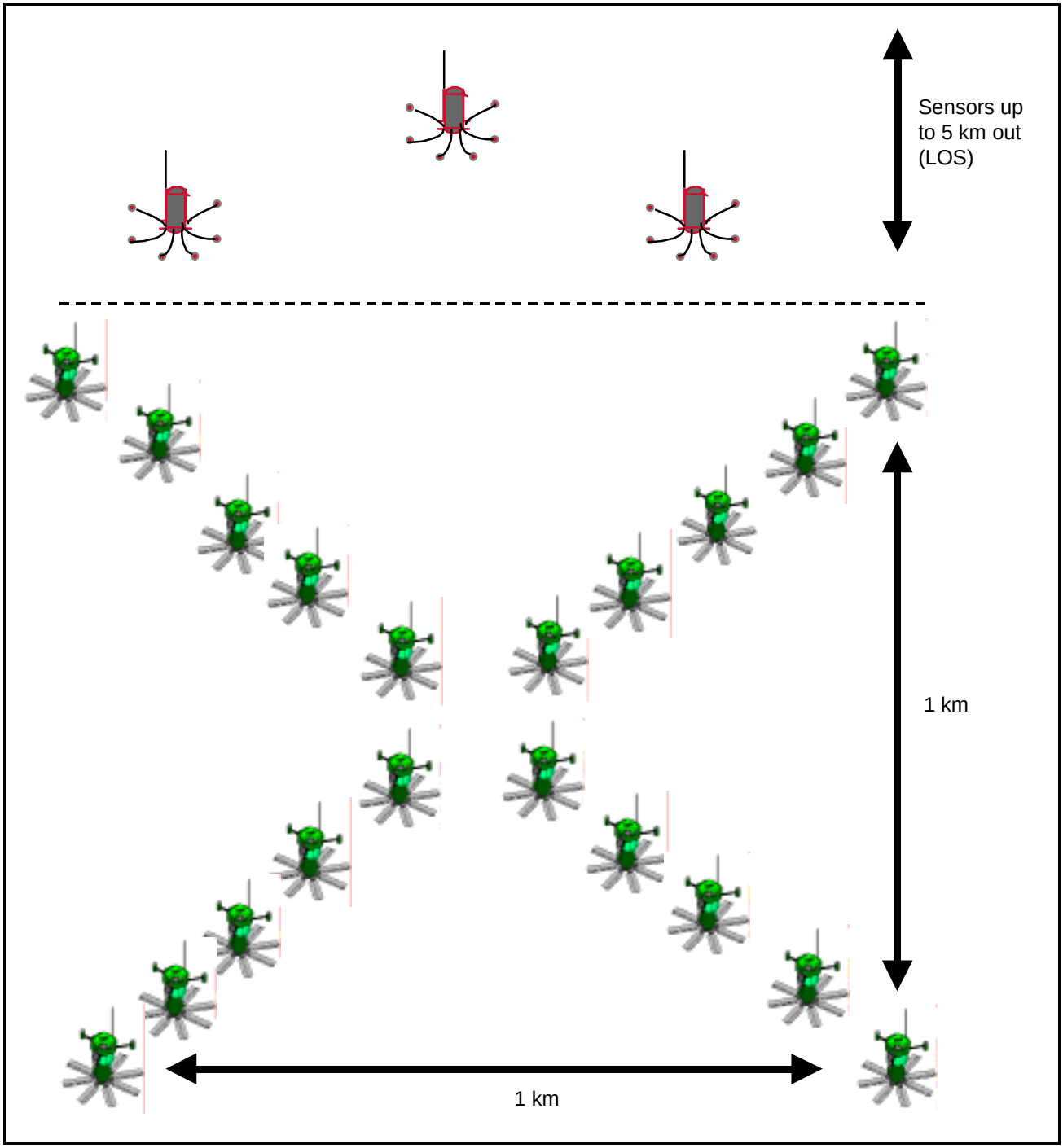


Figure C-16. X-Pattern disrupt obstacle

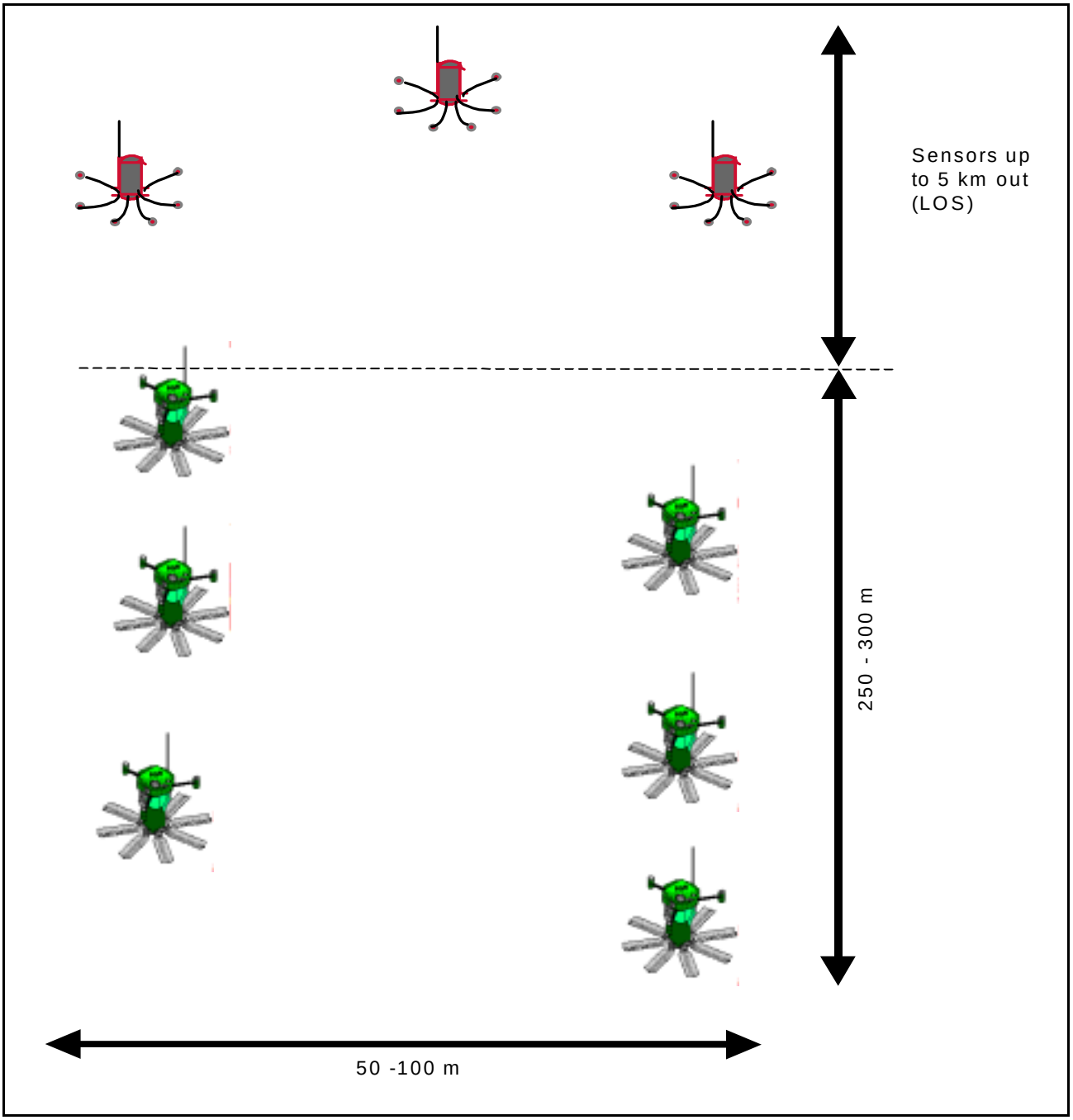


Figure C-17. Gauntlet pattern

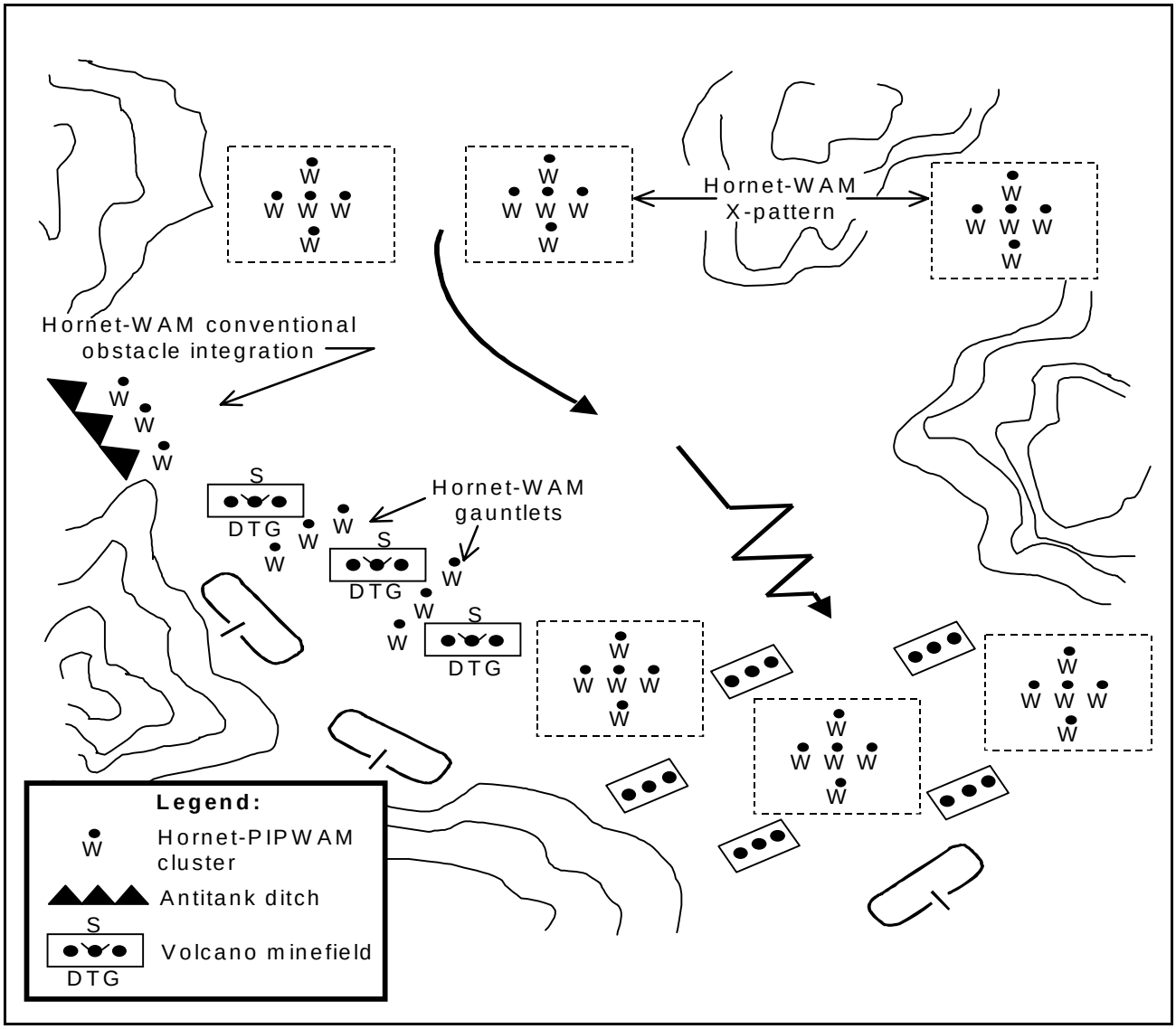


Figure C-18. Raptor ICO integrated with other types of obstacles

a. Command.

b. Signal.

Acknowledge:

Commander's last name
Rank

OFFICIAL:
(Authentication)

Annexes:

Distribution:

CLASSIFICATION

Figure D-1. Brigade OPORD (continued)

The engineer annex includes any combination of written instructions, matrices, or overlays to convey the necessary details of the engineer plan. The engineer annex outlined in the following paragraphs provides a standard format for both offensive and defensive operations. This format standardizes the organization of information included as written instructions. The actual content depends on the type of brigade operation and engineer plan. A standardized annex format makes it easier for the engineer staff officer to remember what should be included and for subordinate staff officers to find required information. The format tailors the standard five-paragraph order to convey critical information.

Matrices may be used as part of the body of the engineer annex or as separate appendices. Matrices are used to quickly convey or summarize information not needing explanation, such as logistics allocations, obstacle-belt priorities and restrictions, or task summary (execution matrix). Finally, overlays are used to give information or instructions and expedite integration into the overall combined arms plan. At brigade level, information included on overlays may include but is not limited to—

- All existing and proposed friendly obstacles and control measures (obstacle belts, restrictions, and lanes; directed or reserve targets; and brigade-level situational obstacles, including associated NAI/TAI and decision points).
- Known and plotted enemy obstacles (must also be on situation template).
- Logistics locations and routes, as they apply to engineer operations.
- NBC-contaminated areas.

Figure D-2, pages D-9 through D-13, is a sample format of a written engineer annex. *Figure D-3, page D-14*, provides a sample matrix and overlay. *Figure D-3a, page D-14a*, is a sample digital obstacle overlay.

ENGINEER UNIT ORDERS

The battalion commander uses a unit order to exercise unit control over engineer units remaining under his command. At the outset of an operation, the battalion commander uses his order to—

- Effect the necessary task organization of engineers in the brigade.
- Assign initial missions.
- Establish sustainment integration with the FSB.

Once the task organization is effective and during combat operations, the battalion commander directs subsequent unit orders only to those engineers under his command. Orders, missions, and instructions to engineers supporting maneuver battalions/TFs in command relationships are included as tasks to the battalions in brigade FRAGOs. A brigade engineer issues WOs to all engineers supporting the brigade to facilitate parallel planning within engineer units and any engineer TFs. WOs to engineers supporting maneuver battalions/TFs are used for planning only.

BRIGADE ENGINEER WO

The purpose of the WO is to help engineer staff officers and engineer units initiate planning and preparations for an upcoming operation. The WO is critical to foster parallel planning at the engineer unit and maneuver battalion levels.

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5. COMMAND AND SIGNAL.

a. Command.

- List the location of key engineer leaders and C^2 nodes throughout the operation.
- Designate a logical chain of command.
- Designate the HQ that controls the effort within work lines on an area basis.

b. Signal.

- Identify communication networks monitored by a brigade engineer for reports, if different than the SOP.
- Identify the designated critical engineer reporting requirements of subordinates, if not covered in the coordinating instructions or the SOP.

Acknowledge:

Commander's last name
Rank

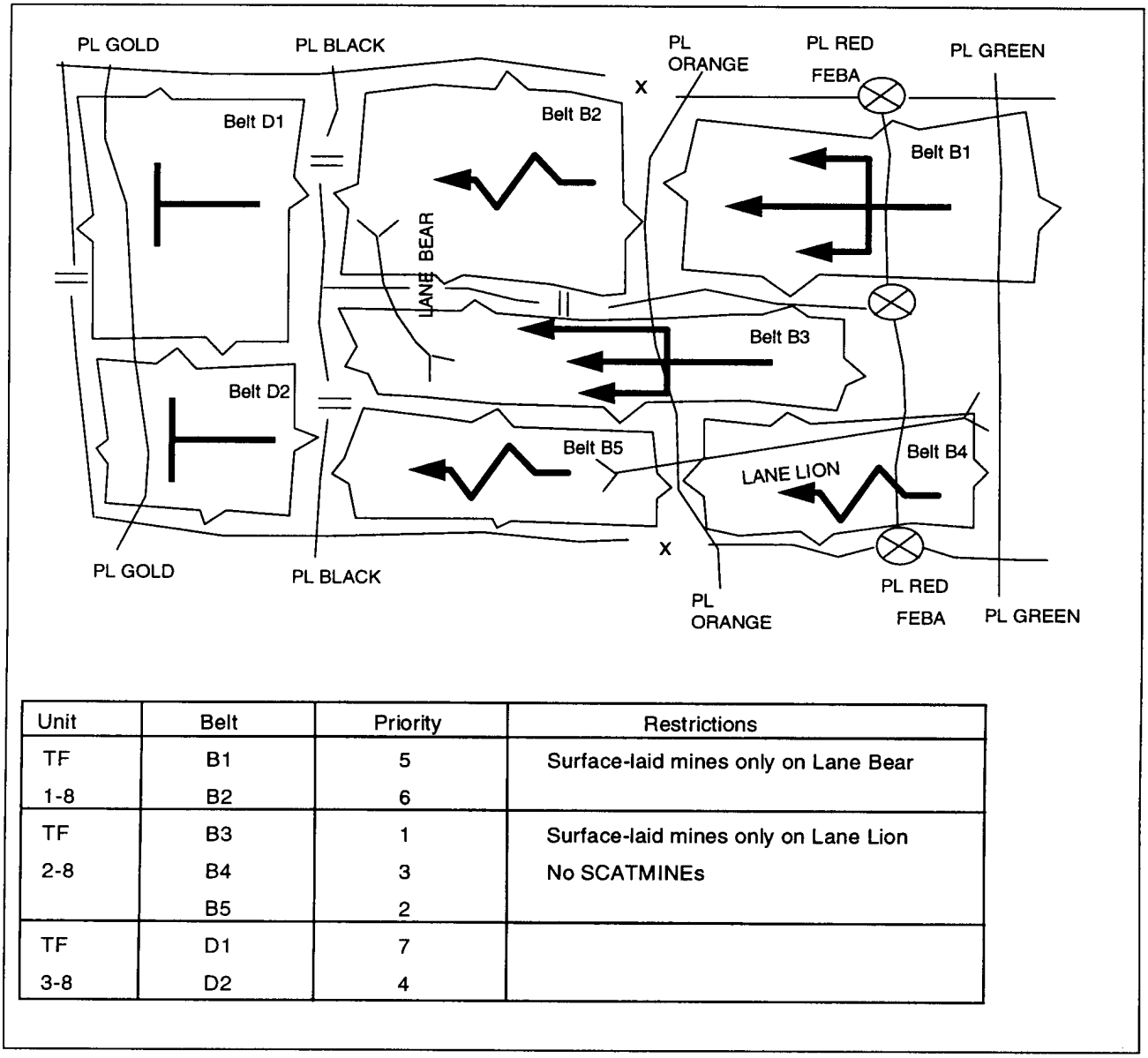
OFFICIAL:

Appendices:
1. Engineer overlay
2. Countermobility execution matrix/time line
3. Survivability execution matrix/time line
4. Obstacle execution matrix (directed, situational, and reserve)
5. Environmental considerations

Distribution:

CLASSIFICATION

Figure D-2. Engineer annex (continued)



Unit	Belt	Priority	Restrictions
TF 1-8	B1	5	Surface-laid mines only on Lane Bear
	B2	6	
TF 2-8	B3	1	Surface-laid mines only on Lane Lion
	B4	3	No SCATMINEs
	B5	2	
TF 3-8	D1	7	
	D2	4	

Figure D-3. Obstacle overlay

There is no prescribed format for the WO. It may be either written, digital, or verbal but should include the following information:

- Heading.
- Situation.
- Attachments and detachments.
- Earliest time of move.
- Nature and time of operation.
- Administrative/logistical information.
- Acknowledge.

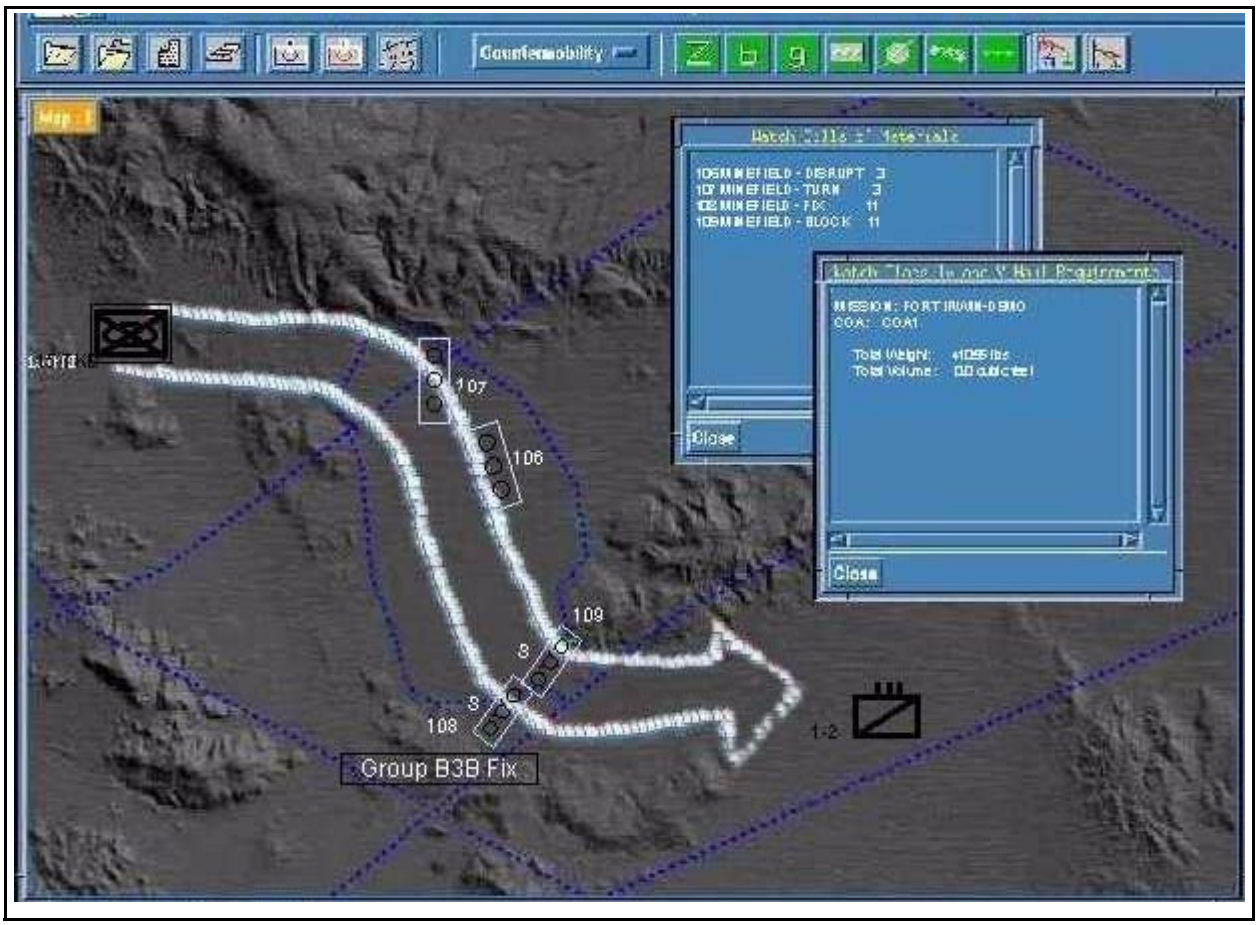


Figure D-3a. Digital obstacle overlay

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Heading

WOs must always begin with the words "Warning Order." This is to ensure that recipients understand the information is for use only as a basis for planning and will be followed by orders. Addressees should also be listed in the heading. The brigade engineer's WO to the unit should address all engineer units supporting the brigade.

Situation

This section includes a brief description of friendly and enemy situations and critical events. It may also include probable missions for the brigade and specified or implied tasks, and it may assign tentative tasks for planning only to engineer units. Situation templates and EBA products may be included with a WO if they are available.

Attachments and Detachments

This section gives tentative and known changes to the task organization. However, it must be clear to engineers supporting maneuver battalions that changes in task organization are for planning and are not effective until after an order is received by the supported battalion from the brigade.

Earliest Time of Move

This section states the earliest possible time that units must be ready to move. The battalion commander may give actual movement times, if known, to units under his command. The earliest time of move is critical to synchronizing sustainment operations to support future missions.

Nature and Time of Operation

This section provides recipients with as much information about the brigade plan as possible to foster parallel planning and preparations and to set priorities. Depending on the maturity of the planning process, this section may include a concept of engineer operations or tentative scheme of engineer operations. Orders for preliminary action may also be included, such as—

- Assigning engineer tasks, such as tactical/technical reconnaissance.
- Establishing Class IV/Class V supply points.
- Moving to linkup points.

These orders are normally qualified as "be-prepared" or "on-order" tasks, depending on how the plan is established. Orders to engineers supporting maneuver battalions are always on-order tasks, with execution instructions coming through maneuver headquarters-generated orders.

Time and Place of Orders Group

Engineer units under the brigade commander are told when and where to receive the entire order and who will attend. Units should identify the composition of the orders group in their SOP.

Administrative and Logistical Information

This includes instructions and warning information on changes in unit logistics operations and linkup with maneuver sustainment systems, as required by future operations. This information may also direct movement to assembly areas and provide instructions for sustainment after movement.

Acknowledge

An acknowledgment of receipt is always required to ensure that the WO is received by all addressees.

ENGINEER BATTALION OPORD

The battalion commander issues an OPORD to all engineer units under his command. Once the task organization is effected, all

instructions and missions to engineers supporting maneuver battalions/TFs are conveyed in brigade orders and are addressed to maneuver battalion commanders. The engineer battalion OPORD is outlined in the following paragraphs (see *Figure D-4, pages D-13 through D-23 for an example). Figure D-5, page D-24*, shows an engineer execution matrix. When an order is an operation plan (OPLAN) instead of an OPORD, the assumptions on which the plan is based are included at the end of the "Situation" paragraph.

ENGINEER BATTALION FRAGO

The battalion commander frequently needs to modify his OPORD to make changes in engineer operations that allow the brigade to take advantage of tactical opportunities. He can do this by issuing a FRAGO. The battalion commander issues FRAGOs only to engineer units under his command. Changes in instructions to engineers supporting maneuver battalions in command relationships are conveyed through input to the brigade FRAGO. A FRAGO does not have a specified format, but an abbreviated OPORD format is usually used. The key to issuing a FRAGO is to maximize the use of the current OPORD by specifying only information and instructions that have changed. The battalion commander is rarely afforded the opportunity to issue FRAGOs to his subordinate leaders face-to-face. With the enhanced capabilities of digital systems, the battalion commander can distribute combat information, updated graphics, and other critical combat information to subordinate units in near real time. The battalion commander may use his XO or CSM to issue the FRAGO in person to subordinates. This ensures that direct coordination is made and that graphics are distributed to platoon leaders. A FRAGO usually contains the following elements:

- Changes to task organization. Lists any required changes to unit task organizations made necessary by modifications to the OPORD.
- Situation. Includes a brief statement of current enemy and friendly situations, which usually gives the reason for the FRAGO. It may also update subordinates on the current status of brigade-level engineer missions.
- Concept. Gives changes to the scheme of engineer operations and the corresponding changes to subunit tasks. It must also include any changes in the brigade or company commander's intent.
- Coordinating instructions. Includes changes to "Service Support" and "Command and Signal" paragraphs of the current OPORD made necessary by the change in the scheme of engineer operations.

APPENDIX E

Tactical Internet

This appendix provides an overview of the primary FXXI communication equipment and TI structure found at echelons brigade and below. It is not intended as an all-inclusive description or identification of each. Refer to the appropriate technical manual for detailed information.

TI OVERVIEW AND CONCEPT

The TI is the term for both the physical communications network that provides the general-purpose data backbone and the overall concept of an integrated battle space automated infrastructure.

The TI is a subset of the warfighter information network (WIN). The WIN is the integration of emerging and existing command, control, communications, computer, and intelligence (C^4I) technologies and concepts. It is designed to increase the security, capacity, and velocity of information distribution throughout the battle space to gain information dominance. *Figure E-1, page E-3,* shows the WIN system's umbrella from corps down to the tactical level.

The TI is an automated router-based data communications network that uses commercial-Internet standard protocols to move data vertical and horizontal throughout the brigade area and to higher level echelons using the MSE tactical-packet network (TPN).

TI SYSTEMS

Within the TI is an assortment of digital systems designed to provide the commander and soldiers of all units of the brigade TF and below, C^2 and SA information. Each echelon of the TF will be comprised of that digital equipment essential for effective C^2 and battle space SA tailored to the operational requirement and particular role of platforms organic to the unit. See *Figure 2-6, page 2-27,* FXXI engineer battalion communications network.

The key TI communication systems employed brigade and below are as follows:

FORCE XXI BATTLE COMMAND

BRIGADE AND BELOW

The FBCB2 host computers includes the Appliqué and the Land Warrior in selected platforms' embedded battle-command (EBC) software.

The FBCB2 is a battle space, battle-command information support system supported by existing and emerging communications, sensors, and electrical power sources. The FBCB2 is both a system and a concept to be used by combat, CS, and CSS units across all BOS disciplines while performing tactical operations.

The FBCB2 computing suite is a mix of commercial, ruggedized, and militarized computers, system software, installation kits, application software, and integrated logistics support. It can be installed in vehicles and issued to individual soldiers. The FBCB2 provides C^2 and SA capabilities to all echelons of the TF through several input devices such as SINCGARS system-improve program (SIP), EPLRS very high-speed integrated circuit (VHSIC), GPS, and BCIS.

ENHANCED POSITION-LOCATION REPORTING SYSTEM VERY HIGH-SPEED INTEGRATED CIRCUIT

The EPLRS VHSIC (AN/VSQ-2 [V]) is a state-of-the-art LOS radio which provides secure, jam-resistant digital communications and accurate position-location capabilities for the user. It has a low probability of interception and detection. The EPLRS VHSIC also provides retransmission functions, which are transparent to the user.

The EPLRS VHSIC is employed in command vehicles and TOC/TAC platforms at the brigade and battalion levels. Included are the combat platforms of the commander, XO, 1SG, platoon leaders, and platoon sergeants at the company and platoon levels. EPLRS VHSIC is used as an alternate data communications link between C^2 platforms at the brigade and battalion levels. It is the primary data communications link between the battalion's C^2 platforms and company's/platoon's combat platforms. See *FM 24-32, Chapter 3,* for further details on the EPLRS VHSIC.

NEAR-TERM DIGITAL RADIO (NTDR)

The NTDR is a brigade and below mobile packet radio used to interconnect the ABCS. It is employed in command vehicles and TOC/TAC platforms. It is used as the primary data and imagery communications link between C^2 platforms at the brigade and battalion levels. It allows up to 400 radios to be employed to serve a nominal brigade area of operations. The NTDR can also be employed in retransmission platforms and reconfigured to provide dedicated retransmission capability.

When establishing the individual NTDR nets, it is important to ensure that the nets are interconnected at several points. This will allow users with net access in one net to send messages to users in another. The interconnection points will typically be in the brigade and battalion TOCs. This allows messages to be tunneled automatically through the ethernet LAN connections within the TOCs from one net to the other.

SINGLE-CHANNEL GROUND/AIRBORNE RADIO SYSTEM-SYSTEM IMPROVEMENT PROGRAM

The SINCGARS SIP (RT-1523C/D) features, with a GPS device interface, embedded GPS position reporting in all voice and enhanced-data-mode (EDM) messages to provide reporting of friendly force positions in support of SA. It uses the Internet controller (INC) to provide packet-radio relay nodes across the battle space for horizontal and vertical integration of C2 data. The SINCGARS SIP is designed to provide voice and data communications capability at all levels. It is the primary path for data transmission at the company, platoon, and squad/team levels.

PRECISION LIGHTWEIGHT GLOBAL POSITION RECEIVER

The PLGR (AN/PSN-11) is a hand-held, self-contained, multichannel receiver capable of receiving the precise positioning signal (PPS) and tracking up to five satellites. It operates on battery or external power. It provides position coordinate, time, and velocity information. It can be operated hand-held, vehicular, aircraft, or facility-mounted. See Technical Manual (*TM) 11-5825-291-13,* for additional details on the PLGR.

Spitfire

The Spitfire (AN/PSC-5) is a single-channel ultrahigh frequency (UHF) satellite communications (SATCOM) terminal. It provides C2 for the division's and corps's warfighter nets, support SOF's C2, and OOTW. The Spitfire SATCOM has embedded COMSEC and transmission security (TRANSEC) capabilities for data, voice, and wire (engineering channel) communications. It is deployed in manpack, vehicular, and aerial operations.

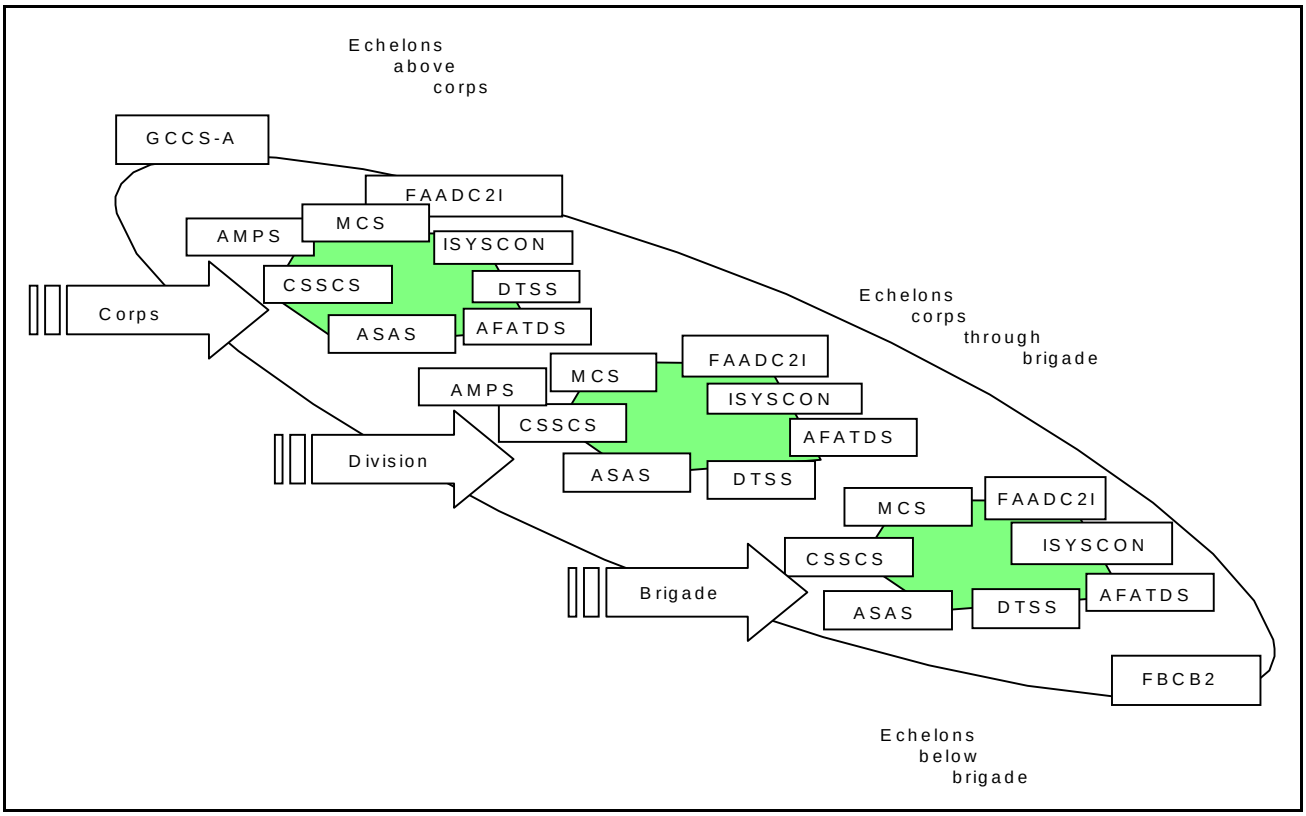

Figure E-1. Warfighter information network links

TI ARCHITECTURE

The TI architecture consists of two substructures. It supports C^2 data and voice and provides near real-time SA information (friendly and enemy locations) improving force C^2 for enhanced lethality, operations tempo, and survivability. These substructures operate simultaneously, are transparent to the user, and are governed by the types of service requested by the host (see *Figures E-2 and E-3, pages E-4 and E-5).*

The TI electronically links all users so that critical C^2 and SA information is available to assist in making tactical decisions. Planners and operators communicating within the TI must understand their role and that of their operational platform. Turning off radios, FBCB2, or improper initialization of equipment will impact the overall functionality of the TI. Operating within the TI carries with it an increased operator responsibility to ensure proper start-up and sustainment procedures are accomplished and a fundamental understanding of how the TI functions.

The C^2 subarchitecture—

- Employs the use of EPLRS VHSIC for primary transmission of data; secondary means is the SINCGARS SIP.
- Defines the C^2 data as anything not classified as SA data.
- Allows operators to send C^2 information in the form of VMF messages through an interface connection of FBCB2, SINCGARS SIP with INC, EPLRS VHSIC, and PLGR. These messages include operational overlays, orders, reports, and free-text messages formatted in the FBCB2.
- Allows operators to set their FBCB2 to specific default settings relative to time, motion, and battle space and set their send settings to precedence,

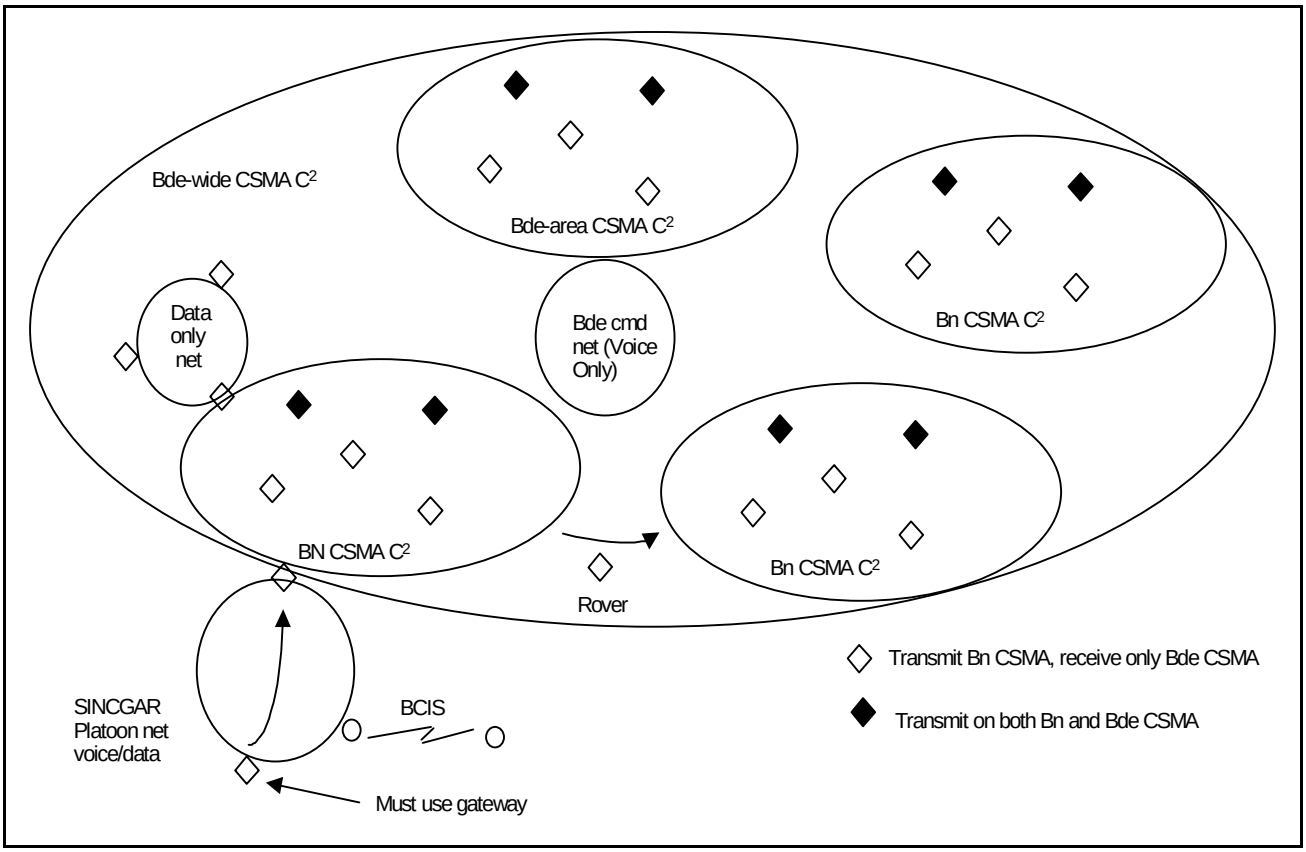

Figure E-2. Example TI C^2 architecture

retries, acknowledgment, addressee, and other displays.

The SA subarchitecture's—

- Information has precedence within the TI as it travels through the routers and gateways.
- Information primarily enables friendly forces to identify other friendly units and avoid fratricide.
- Information includes all friendly unit positions and known enemy positions from all relevant sources. Each FBCB2 reports its position over the TI to a designated SA server that disseminates the information based on filter settings and the SA subarchitecture. This process occurs automatically with minimal operator intervention once settings are established. Friendly locations are built from individual platform reports.
- Enemy locations are added from ASAS-RWS at brigade level and broadcasted back down.

The TI provides an intra-ABCS interoperability path at brigade and below. The FBCB2 system exchanges information with the higher level components of the ABCS in selected platforms such as the battle command vehicle (BCV), C2V, and the Army airspace command and control (A2C2) vehicle.

This path allows the sharing of digitized data by commanders, staffs, units, and soldiers/weapon platforms, resulting in improved C^2 and near real-time SA. The path services the host computer and subsystems of the ATCCS that include the—

- MCS.
- AFATDS.
- ASAS-RWS.
- CSSCS.
- Forward-Area Air-Defense Command, Control, and Intelligence (FAADC2I) system.

When deploying the TI, it must be split into multiple autonomous systems (AS) to accommodate its size. These AS are a grouping of equipment that comprises a single-net management domain (such as brigade/battalion areas).

SA is disseminated throughout the TI by a combination of SA servers broadcasting position reports. These SA servers may be local-area, medium-area, or wide-area servers.To disseminate SA data between CSMA areas, a multiple-source-group (MSG) need line is used. All EPLRS VHSIC radios in the battle space can listen on the MSG. A few EPLRS VHSIC radios are designated as MSG transmitters in preoperational planning.

The SINCGARS SIP radio is responsible for sending and receiving voice, SA, and C^2 data for those platforms not equipped with EPLRS VHSIC radios. Interfacing with a PLGR and FBCB2 computer, SA information is broadcasted to all SINCGARS SIP net members, and the SA data is displayed on FBCB2 screens.

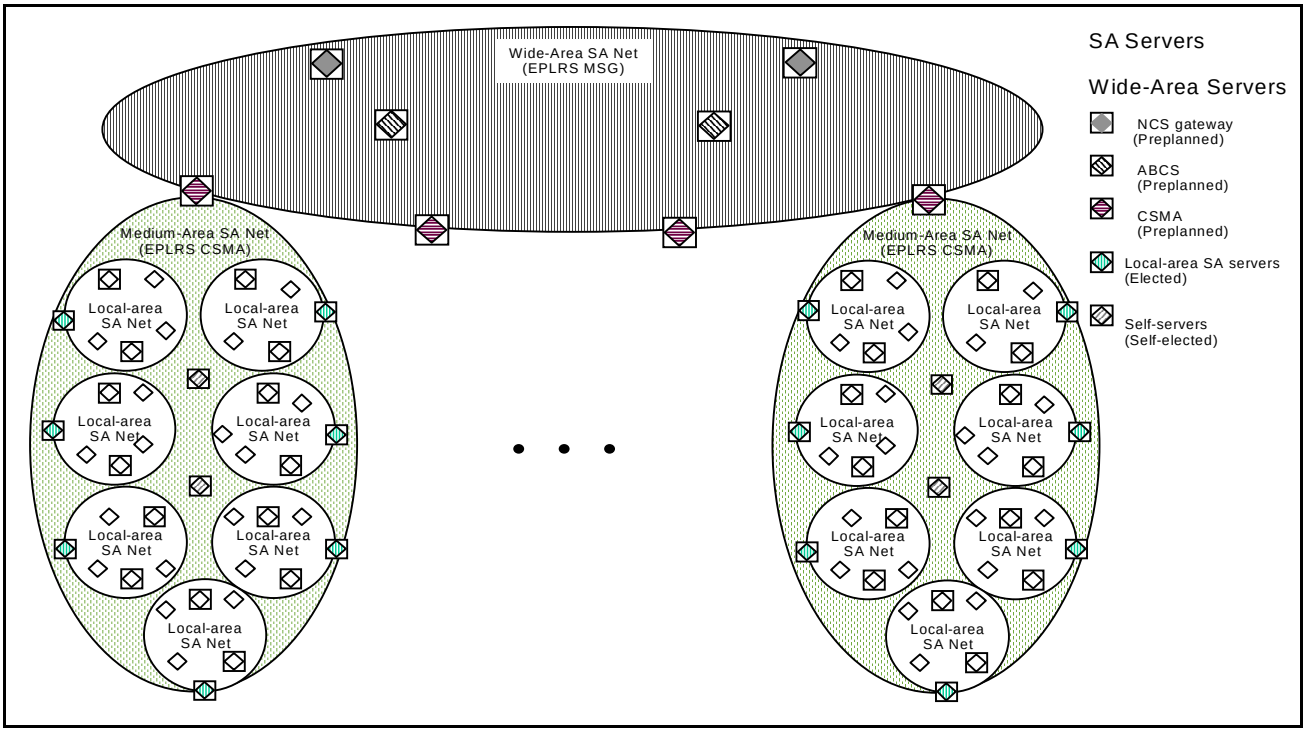

Figure E-3. Example TI SA architecture

ARMY BATTLE COMMAND SYSTEMS

The ABCS supports leaders and planners at tactical to strategic levels through an integrated digital-information network. This network is designed to provide automated C^2 and SA information through a seamless data architecture of existing and planned C^2 systems. The ABCS includes the ATCCS, the Global Command-and-Control System-Army (GCCS-A), and the FBCB2 systems (see *Figures E-4 and E-5, pages E-6 and E-7).*

ARMY TACTICAL COMMAND AND CONTROL SYSTEM

The ATCCS integrates the seven BOSs (C^2, maneuver, M/S, FS, AD, CSS, and intelligence). Each functional area is supported by a control system that is designed to provide leaders and planners with information to plan, coordinate, control, and direct the battle effectively. These BOS control systems are oriented toward combat operations and pro-

vide the commanders and staffs, at corps and below, with situational information and decision support in executing the operational/tactical battle. From corps down to the battalion level, ATCCS provides additional C^2 and SA information by providing commanders and staffs the synchronization tools for the exchange of information during operations. The BOS components are linked through four communications systems: combat net radio (CNR), an area common-user system (ACUS), an Army-data distribution system (ADDS), and a broadcast system (BDCST).

The physical configuration of ATCCS LANs varies with the information flow requirements at each echelon. The LANs logical architecture remains the same throughout the system.

An ATCCS's LAN consists of multiple BOS component systems sharing the same LAN at a CP. The TPN serves as the communications link for the WAN which connects the various ATCCS's LANs across the battle space. While the CSSCS, AFATDS, FAADC2I, and ASAS-RWS BOS component systems may also operate their own internal LANs for stovepipe communications, the ATCCS's LAN is the primary communications path for passing information horizontally between BOSs. The TPN is also known as the MSE packet switch network, or MPN. The primary assets used for TPN communications include the node center (NC), the SEN, the large extension nodes (LEN), and the system control center (SCC). These assets form the backbone of the tactical network linking the ATCCS's LANs (see *Figure E-6, page E-7*).

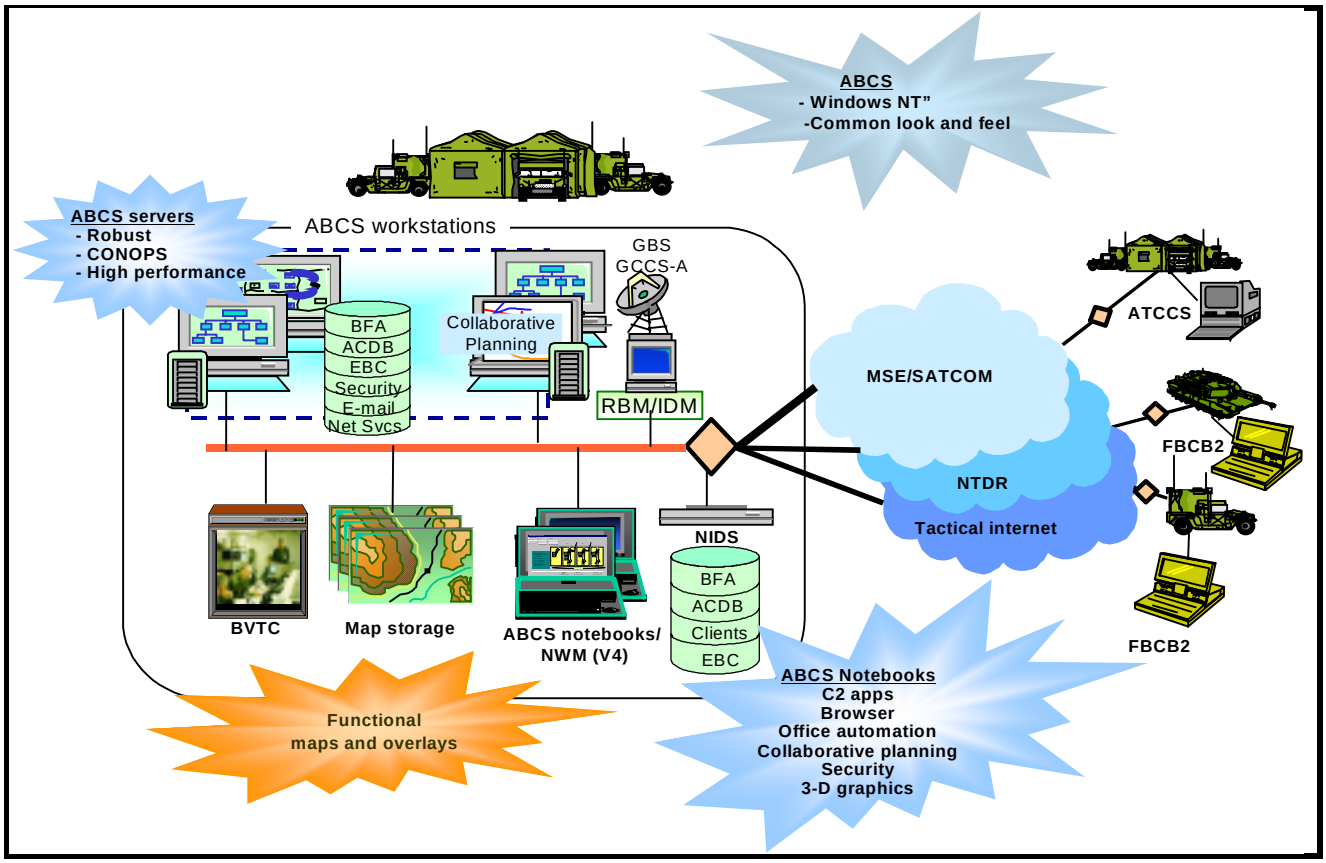

Figure E-4. ABCS's components

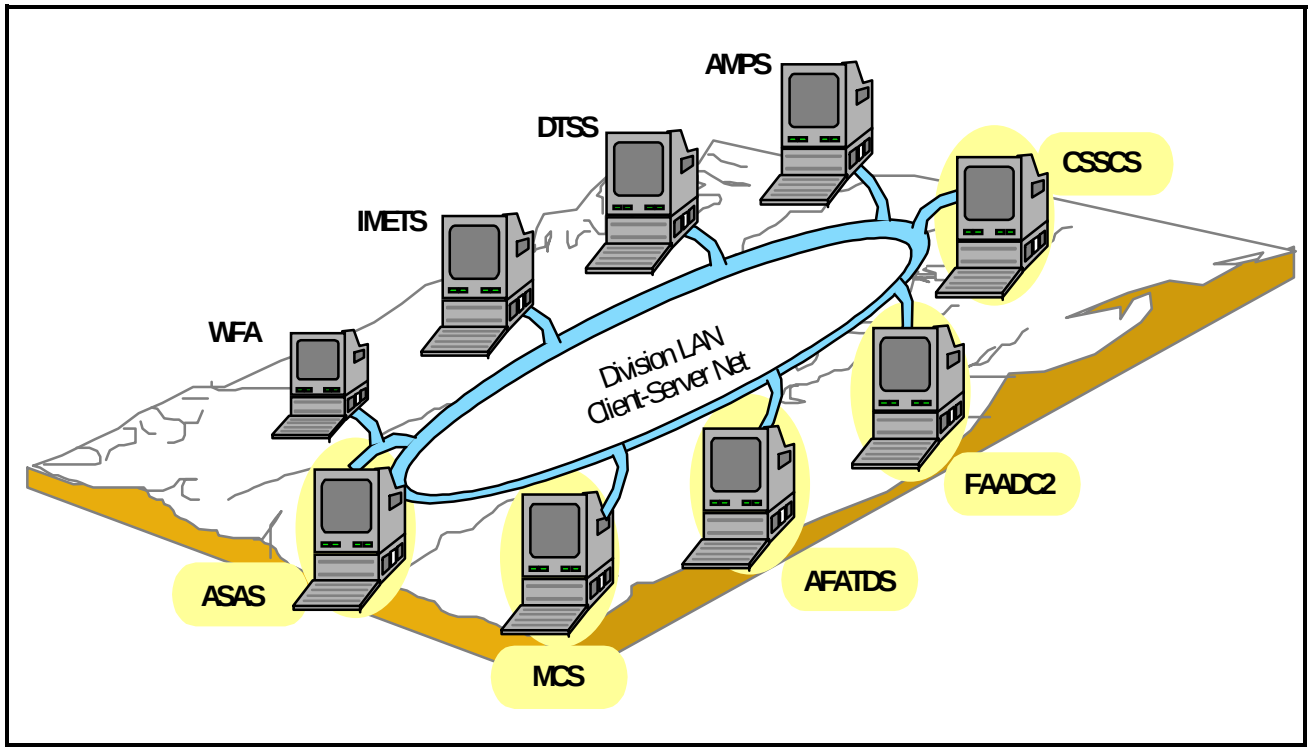

Figure E-5. Typical ABCS linked on a command post local area network

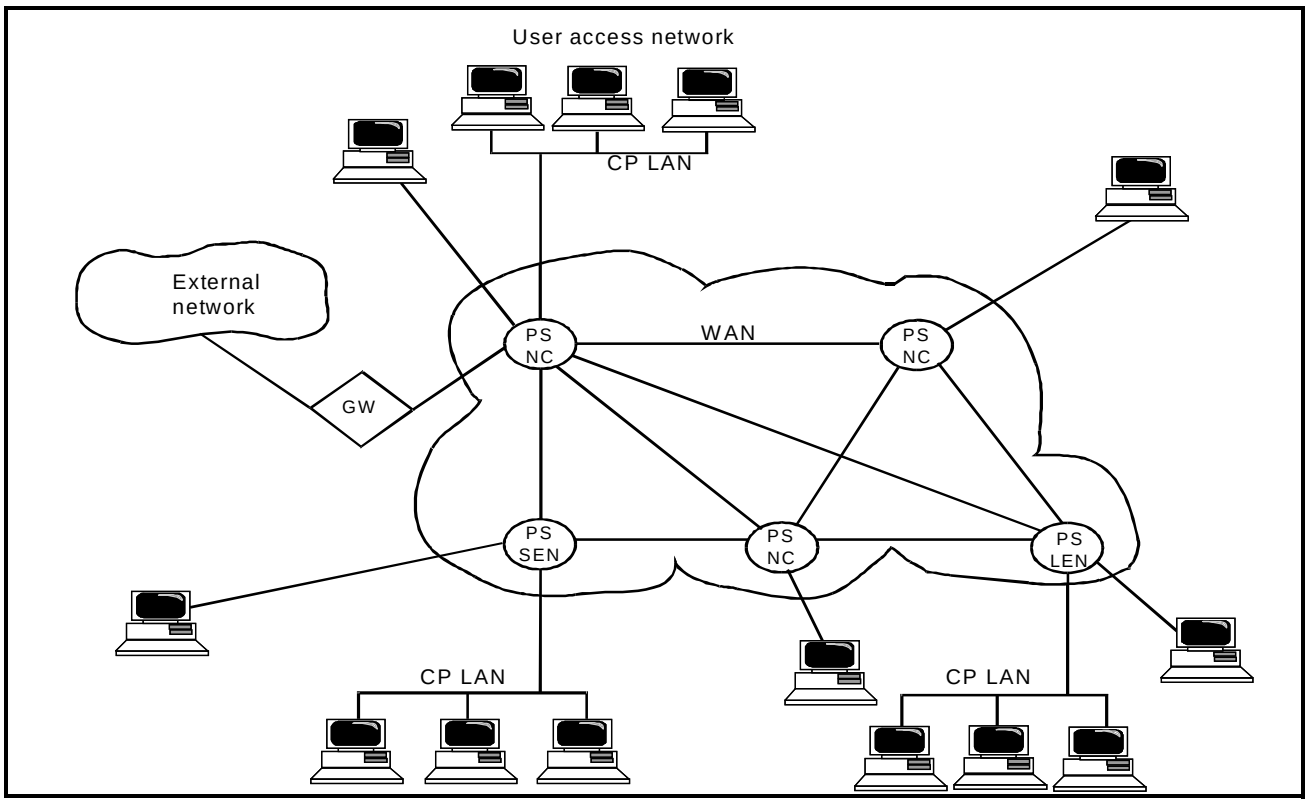

Figure E-6. Representative MSE architecture

BATTLEFIELD OPERATING SYSTEMS

The FXXI brigade combined-arms teams' commanders and staffs exercise force-level control by integrating and synchronizing the efforts of each BOS to support the mission. This is accomplished by managing information from individual BOS interests and developing tactical plans and orders based on that information. Each BOS uses different digital components of the ABCS architecture. These digital systems provide specific BOS information that can be integrated to provide C^2 to the command.

MANEUVER CONTROL SYSTEM

The MCS is the maneuver component of the ATCCS. It is the primary information system supporting the commander and staff. The MCS provides the principal operational interface with necessary applications to access and manipulate the force-level database. Its wide array of capabilities makes planning and executing a battle plan more efficient. The MCS's capabilities range from modifying UTOs to creating overlays. The engineer specific C^2 capability embedded within the MCS is called the MCS-ENG function. Commanders and staffs update the MCS database by entering readiness data, battle plans, and battle-plan changes as they occur at each echelon.

The MCS/MCS-ENG consists of window-and menu-based software allowing system operators to process, retrieve, store, and send information in textual or graphical form. Reports, OPORDs, overlays, UTOs, and messages are available to the user.

NOTE: The battalion engineer primarily uses the MCS-ENG function of the MCS to effect engineer planning and coordination and exercise C^2 during mission execution. The MCS-ENG is located at engineer cells in the corps, division, brigade, and battalion CPs. See *Appendix D* for more information on the MCS-ENG.

ADVANCED FIELD-ARTILLERY TACTICAL-DATA SYSTEM

The AFATDS is an integrated FS C^2 system capable of processing fire missions and related information to coordinate and maximize all FS assets. These assets include field artillery, mortars, attack helicopters, air support, naval gunfire, and offensive electronic warfare.

FORWARD-AREA AIR-DEFENSE COMMAND, CONTROL, AND INTELLIGENCE

The FAADC2I is an integrated system of weapons, sensors, and C^2, which protects maneuver forces, critical CPs, CS, and CSS elements from low-altitude air attack. It controls and integrates AD engagement operations and combined-arms force operations for AD elements. To support engagement operations, the FAADC2I system responds to air threats by integrating targeting functions, including sensor operations and AD weapons' C^2 functions. It acquires and tracks incoming air threats, identifies friendly and enemy aircraft, and automatically alerts forward AD weapons. It assists battle managers in planning, coordinating, synchronizing, directing, and controlling the counterair fight. It also assists in developing and disseminating timely target data to all forward area air defense (FAAD) components. To support force operations, the FAADC2I system provides force-level commanders with the information needed to integrate AD into the overall tactical plan.

ALL-SOURCE ANALYSIS SYSTEM—REMOTE WORKSTATION

The ASAS-RWS is a functionally integrated intelligence support system. It manages sensors and other resources; collects, processes, and fuses intelligence data; stores, manipulates, and displays this data; and quickly disseminates information to the commander by

providing a common picture of the enemy's SA. It also supports the commander's decision-making process 24 hours a day whether on the battle space or in rear support areas.

The ASAS-RWS prioritizes and manages collection assets; it processes, receives, and correlates data from strategic and tactical sensors and other sources to produce ground-battle situation displays. The system then disseminates intelligence information to assist the commander in refining his guidance and to aid in target development.

COMBAT SERVICE SUPPORT CONTROL SYSTEM

The CSSCS is the logistics component of the ATCCS and provides critical, timely, integrated, and accurate automated logistical information. This system provides information on all classes of supply, field services, maintenance, medical services, and movements to commanders and staffs. This information is consolidated and collated into SITREPs and planning estimates for current and future operations. The CSSCS provides a concise picture of a unit's requirements and support capabilities by collecting, processing, and displaying information on key items of supplies, services, and personnel that the commanders deem crucial to the success of an operation. See *Chapter 6* for additional information on the CSSCS.

AVIATION MISSION-PLANNING SYSTEM (AMPS)

The AMPS is an automated aviation mission-planning, rehearsal, and synchronization tool designed specifically for the aviation commander. There are two levels of AMPS, brigade/battalion and company. Each level provides the automated capability to conduct aviation missions. The brigade/battalion AMPS is hosted on the common hardware/software II platform. The AMPS will be found in the FXXI maneuver brigade's aviation cell.

GLOSSARY

12Z50	E8
1SG	first sergeant
3-D	Three-dimensional
A&L	administrative/logistics
A/1	Alpha/1st platoon
A/2	Alpha/2d platoon
A/3	Alpha/3d platoon
A2C2	Army airspace command and control
AA	avenue of approach
AAFES	Army and Air Force Exchange Service
AAS	advanced acoustic sensors
ABCS	Army Battle Command System
ABE	assistant brigade engineer
ABF	attack by fire
ACDB	Army Battle Command System common data base
ACE	M9 armored combat earthmover
ACH	Army common hardware
ACK	acknowledgment message
ACT	analysis and control team
ACUS	area common-user system
AD	air defense
ADA	air-defense artillery
ADAM	area denial artillery munition
ADAPCP	Army drug-and alcohol-prevention control program
ADE	assistant division engineer
ADDS	Army data-distribution system
ADO	Air Defense Officer

AFATDS	Advanced Field-Artillery Tactical-Data System
AG	Adjutant General
AIMS	Army Information Management System
ALOC	administrative logistics operations center
AM	Amplitude modulation
AMDWS	Air-Missile Defense Workstation
ammo	ammunition
AMPS	Aviation Mission-Planning System
AO	area of operations
AOI	area of interest
AOS	acoustic overwatch sensor
APC	armored personnel carrier
approx	approximate
APOBS	antipersonnel obstacle breaching system
APPS	automated personnel-planning software
ARCIS	Army company information system
ARSOF	Army special operations forces
AS	autonomous system
ASAS	All-Source Analysis System
ASAS-RWS	All-Source Analysis System–Remote Workstation
ASL	authorized stockage list
ASP	ammunition supply point
ASTAMIDS	airborne standoff mine/minefield detection and survey system
AT	antitank
ATAV	Army total asset visability
ATCCS	Army Tactical Command and Control System
ATK	attack
ATP	ammunition transfer point
attn	attention
AVLB	armored vehicle-launched bridge
AWE	advanced warfighting experiment

AXP	ambulance exchange point
B/1	Bravo/1st platoon
B/2	Bravo/2d platoon
B/3	Bravo/3d platoon
B	bulk
BAS	battalion aid station
BAS	Battlefield Automated System
BCIS	Battlefield Combat Identification System
BCT	brigade combat team
BCV	battle command vehicle
BDAR	battle-damage assessment repair
BDCST	broadcast system
BDE	brigade
BESV	Bradley engineer squad vehicle
BFA	Battlefield functional area
BFSA	brigade forward support area
BFV	Bradley fighting vehicle
BGP	border gateway protocol
BHL	battle handover line
BII	basic issue items
BIT	built-in test
BMO	battalion maintenance officer
BMT	battalion maintenance technician
bn	battalion
BOS	Battlefield Operating System
BP	battle position
BRIL	baseline resource item list
BRT	brigade reconnaissance troop
BSA	brigade support area
BSC	base support company

BSFV	Bradley stinger fighting vehicle
BSO	brigade signal officer
BVTC	battlefield video-teleconferencing
C/1	Charlie/1st platoon
C/2	Charlie/2d platoon
C/3	Charlie/3d platoon
C^2	command and control
C^3	command, control, and communications
C^2I	command, control, and intelligence
C^3I	command, control, communications, and intelligence
C^4I	command, control, communications, computers, and intelligence
C^2V	command-and-control vehicle
CAA	combined-arms army
CANTCO	cannot comply
CAS	close air support
CASEVAC	casualty evacuation
CATK	counterattack
cbt	combat
CCIR	commander's critical information requirements
CCM	cross-country mobility
CCL	combat-configured loads
CDMP	combat decision-making process
cdr	commander
CEB	clothing exchange and bath
CEV	combat engineer vehicle
CFA	call-forward area
CFL	coordinated fire line
cfm	cubic foot (feet) per minute
CFS	call for support

CFZ	critical friendly zone
CGS	common ground station
CHEMO	chemical officer
CHD	conservative heavy division
CHS	combat health support
CHSPLAN	combat health support plan
CIC	command information center
CIRCE	countermobility remote control system
CISCO	Manufacturer's name for a commercial modular access router
CLS	combat lifesaver
cmd	command
CMD/CIC	command/combat information center
CMS	combat medical section
CMT	company maintenance team
CNR	combat net radio
CO	company
COA	course of action
CONOPS	contingency operations
COLT	combat observation lazing team
COMSEC	communications security
COO	combined obstacle overlay
CP	command post
CR	counter-reconnaissance
CRT	combat repair team
CS	combat support
CSA	corps support area
CSE	combat support equipment
CSM	command sergeant major
CSMA	carrier-sense multiple access
CSR	controlled supply rate
CSS	combat service support

CSSCS	Combat Service Support Control System
CST	company support team
CTIL	commander tracked item list
ctr	center
DA	Department of the Army
DAO	division ammunition officer
DATK	deliberate attack
DAWE	Division Advanced Warfighting Experiment
DB	database
DD	Defense Department
DET	detachment
DISCOM	division support command
DISN	defense information system network
DISTRO	distribution
DIV	division
DIVE	dive detachment
DIVEN	division engineer
DLIC	detachment left in contact
DMA	Defense Mapping Agency
DMAIN	division main command post
DMCO	division movement-control office
DMMC	division materiel management center
DMS	defense message system
DNVT	digital nonsecure voice terminal
DOD	Department of Defense
DRS	Digital Reconnaissance System
DS	direct support
DSA	division-support area
DSB	division support battalion
DST	decision support template

DSVT	digital secure voice terminal
DTAC	division tactical command post
DTD	digital terrain data
DTED	digital terrain elevation data
DTSS	Digital Topographic Support System
DU	display unit
DZ	drop zone
E8	master sergeant
E9	command sergeant major
E-mail	electronic mail
EA	engagement area
EAC	echelons above corps
EAD	echelons above division
EBA	engineer battlefield analysis
EBC	embedded battle command
ECB	echelons corps and below
EDM	enhanced data mode
EEP	engineer equipment parks
EGA	enhanced graphics adapter
EHF	extremely high frequency
ELM	electronic maintenance
ELSEC	electronic security
EM	enlisted men
ENCOORD	engineer coordinator
engr	engineer
EOD	emergency ordance disposal
EOPS	engineer operations
EPLRS	Enhanced Position-Location Reporting System
EPW	enemy prisoner of war
equip	equipment

ERP	engineer regulating point
ESA	engineer support area
ESE	engineer support element
ETAC	enlisted terminal attack controller
EVENTEMP	event template
FA	field artillery
FAAD	forward area air defense
FAADC2I	Forward-Area Air-Defense Command, Control, and Intelligence
FAS	forward aid station
FASCAM	family of scatterable mines
FAX	facsimile
FBCB2	Force XXI battle command brigade and below
FEBA	forward edge of the battle area
FH MUX	frequency hopping multiplexer
FIST	fire-support team
FIST-V	fire-support-team vehicle
FIT	fault-isolation test
FKSM	Fort Knox supplemental manual
fld	field
FLOT	forward line of own troops
FM	field manual
FM	frequency modulated
FMS	Force XXI Manning System
FRAGO	fragmentary order
freq	frequency
FS	fire support
FSB	forward support battalion
FSC	forward support company
FSCOORD	fire-support coordinator
FSE	fire-support element

FSMC	forward-support medical company
FSO	fire-support officer
FSP	forward supply point
FTP	file transfer protocol
FWDREP	forward repair
FXXI	Force XXI
G1	Assistant Chief of Staff, G1 (Personnel)
G2	Assistant Chief of Staff, G2 (Intelligence)
G4	Assistant Chief of Staff, G4 (Logistics)
G6	Assistant Chief of Staff, G6 (Communications)
GCCS-A	Global Command-and-Control System - Army
GCS	gateway control system
gen	generation
Gen	general
GPS	Global Positioning System
grp	group
GS	general support
GSE	ground-support equipment
GSR	ground surveillance radar
GSR	general support reinforcing
GW	gateway
HATK	hasty attack
HAVECO	have complied
HCMT	heavy contact maintenance truck
HE	high explosive
HEMTT	heavy expanded mobility tactical truck
HET	heavy-equipment transporter
HF	high frequency
HHC	headquarters and headquarters company

HLZ	helicopter landing zone
HMMWV	high mobility, multipurpose wheeled vehicle
HN	host nation
Hornet	antitank/antivehicular off-route munition
HQ	headquarters
HS3	Hunter Sensor Surrogate System
HUMINT	human intelligence
HVT	high-value target
hvy	heavy
IBM	International Business Machine
ICCR	integrated-circuit chip reader
ICO	intelligence combat outpost
IDS	information dissemination server
IEW	intelligence electronic warfare
IFF	identification, friend, or foe
IHFR	improved high frequency radio
IIR	intelligence and information requirement
IMETS	Integrated Meteorological System
IMINT	imagery intelligence
INC	Internet controller
INFOSEC	information security
INTEL; intel	intelligence
IO	information operations
IOS	internetwork operating system
IP	intervention points
IP	internet protocol
IPB	intelligence preparation of the battlefield
IR	intelligence requirements
IREMBASS	Improved Remotely Monitored Battlefield Sensor System
ISYSCON	Integrated system control

IV	intervisibility
JP-8	jet propulsion
JSTARS	Joint Surveillance Target Attack Radar System
KCLFF	kitchen, company-level field feeding
KIA	killed in action
km	kilometers
LAN	local area network
LBA	Longbow Apache
LC	line of contact
LD	line of departure
LEN	large extension node
LMTV	light medium tactical vehicle
LO	liaison officer
LOA	limit of advance
LOC	lines of communication
LOC	logistics operation center
LOD	line of duty
LOG	logistics
LOGPAC	logistical package
LOGSITREP	logistical situation report
LOM	line of movement
LOS	line-of-sight
LP	listening post
LPXMED	logistics processor external medical module
LRAS3	Long-Range Acquisition Scout Sensor Suite
LRP	logistics release point
LRU	line-replacement unit
LSD	large-screen display
lt	light

LTO	logistics task order
LTV	light tactical vehicle
m	meters
M/CM	mobility and countermobility
M/CM/S	mobility, countermobility, and survivability
M/S	mobility and survivability
MA	mortuary affairs
MACP	mortuary affairs collection point
MAINT	maintenance
MARC	multitechnology automated reader card
MAS	main aid station
MBA	main battle area
MCL	mission-configured load
MCO	movement-control office
MCOO	modified combined obstacle overlay
MCS	maintenance-control section
MCS	Maneuver Control System
MCS-ENG	Maneuver Control System-Engineer
MEA	munitions effects assessment
mech	mechanized
MED	medical
MEDEVAC	medical evacuation
MEDLOG	medical logistics
METT-T	mission, enemy, terrain, troops, and time available
MGB	medium-girder bridge
MGRS	military grid reference system
MGT	management
MHE	material-handling equipment
MHz	megahertz
MI	Military Intelligence

MIA	missing in action
MICLIC	mine-clearing line charge
MIL	military
MKT	mobile kitchen trailer
MLRS	multiple launched rocket system
MOB	mobility
MOGAS	motor gasoline
MOPMS	modular pack mine system
MOPP	mission-oriented protective posture
MOS	military occupational specialty
MP	military police
MRB	motorized rifle battalion
MRC	motorized rifle company
MRD	motorized rifle division
MRE	meals, ready-to-eat
MRP	motorized rifle platoon
MSB	main support battalion
MSC	maneuver support company
MSE	mobile subscriber equipment
MSG	multiple source group
MSG	message
MSI	multi-spectral imagery
MSIP	multi-spectral image processor
MSL	mean sea level
MSR	main supply route
MSRT	mobile subscriber radio telephone
MST	maintenance support team
MTC	movement to contact
MTF	medical treatment facility
MTS	movement tracking system
MTV	medium tactical vehicle

MWR	morale, welfare, and recreation
MVR	maneuver
NAI	named area of interest
NBC	nuclear, biological, and chemical
NC	node center
NCO	noncommissioned officer
NCOIC	noncommissioned officer in charge
NCS	net control station
NCS-E	net control station-EPLRS
NIDS	network intrusion detection system
net	network
NIMA	National Intelligence Mapping Agency
NLT	not later than
NRI	net radio interface
NT	new technology
NTDR	near-term digital radio
NWM	network manager
O&I	observation and intelligence
OB	order of battle
OBSTINTEL	obstacle intelligence
OCIE	organizational clothing and individual equipment
OCOKA	observations and filed of fire, cover and concealment, obstacles, key terrain, and avenues of approach
O&I	operations and intelligence
OIC	officer in charge
OOTW	operations other than war
OP	observation post
OPCON	operational control
OPLAN	operation plan

opns	operations
OPORD	operation order
OPS	operations
OPSEC	operations security
org	organize
P	package
PAC	personnel and administration center
PAL	point, area/linear
PAS	Personnel Accountability System
PASR	personnel accounting and strength reporting
PCC	precombat checks
PCI	precombat inspection
PERS	personnel
PERSITREP	personnel situation report
pet	petroleum
PIP	product improvement program
PIR	priority intelligence requirements
PL	phase line
PLGR	precision lightweight global positioning system receiver
PLL	prescribed load list
plt	platoon
POL	petroleum, oils, and lubricants
POP	point of penetration
POS/NAV	position/navigation
PPS	precise positioning signal
prof	profile
PS	packet switch
PSB	personnel services battalion
PSG	platoon sergeant
PSN	packet switch network

PSNCO	personnel staff noncommissioned officer
PSS	personnel service support
PSSCS	personnel service support control system
PVNTMEP	preventive medicine
pwr	power
QM	quartermaster
QRMP	quick-response multicolor printer
QSS	quick supply store
R&S	reconnaissance and surveillance
RB-15	rubber boat
R	reinforcing
RAAMS	remote antiarmor mines
RAM	random access memory
RAPIDS	Real-Time Automated Personnel Identification System
RBM	receive-broadcast management
RCP	relevant common picture
rec	receipt
rep	repair
RFA	restrictive fire area
RFI	request for information
RGB	red, blue, and green
Ribbon	ribbon bridge
RII	request for intelligence information
RP	release point
RSR	required supply rate
RSSP	ration supplement/sundries pack
RT	receiver/transmitter
RTD	return to duty
RTE	route

RWS	remote workstation
RWS	rigid wall shelter
RX	repairable exchange
S&S	supply and service
S&T	supply and transportation
S1	Adjutant (US Army)
S2	Intelligence Officer (US Army)
S3	Operations and Training Officer (US Army)
S4	Supply Officer (US Army)
S6	Signal Officer (US Army)
SA	situational awareness
SA	staging area
SALUTE	size, activity, location, unit, time, and equipment
SAMS	standard Army maintenance system
SARSS-O	Standard Army Retail Supply-System Objective
SAT	satellite
SATCOM	satellite communications
SBF	support by fire
SCATMINE	scatterable mine
SCC	system control center
SCL	standard configured load
SCSI	small computer system interface
SEC	section
SEE	small emplacement excavator
SEN	small extension node
SGT	sergeant
SICPS	standard integrated command post system
SIGINT	signal intelligence
SIGO	signal officer
SIGSEC	signal security

SINCGARS	single channel, ground-to-air radio system
SIP	system-improvement program
SIPRNET	secret internet protocol network
SITEMP	situation template
SITMAP	situation map
SITREP	situation report
SIV	system integration vehicle
SOES	Scheme of engineer operations
SOF	special operations forces
SOI	signal operating instructions
SOP	standing operating procedure
SOR	specific orders and requests
spec	specialist
SPO	Support Operations Officer
SPOTREP	spot report
SPR	secure packet radio
spt	support
sptd	supported
SRP	soldier-readiness processing
ST	self-test
STAMIS	Standard Army Management Information System
STD	standard
STE-ICE	simplified test equipment-internal combustion engine
svc	service
synch	synchronization
TAC	tactical
TACCS	tactical Army combat service support computer system
TACSAT	tactical satellite
TAI	target area of interest
TAMMS	The Army Maintenance Management System

TC-AIMSII	Transportation Corps - Automated Information Management System II
TCMD	transportation control movement document
TCP	traffic control point
TCP/IP	transmission control protocol/internet protocol
TCS	tactical control station
TDA	target damage assessment
TDMA	time division multiple access
TDR	term data radio
tech	technician
TEM	terrain-evaluation model
ter det	terrain detachment
TERRABASE II	terrain visualization and imagery database
TF	task force
TFM	tactical field maintenance
TFSA	task-force support area
TFXXI	Task Force XXI
TI	tactical Internet
TLP	troop-leading procedures
TM	technical manual
tm	team
TMDA	time division multiplexing access
TOC	tactical operations center
TOE	table(s) of organization and equipment
TOW	tube-launched, optically tracked, wire-guided
TPL	time phase line
TPN	tactical-packet network
TRADOC	Training and Doctrine Command
TRANSEC	transmission security
trk	truck
TSA	theater support area
TTADB	tactical terrain analysis data base

TTP	tactics, techniques, and procedures
TVA	target-value analysis
UAV	unmanned aerial vehicle
UHF	ultrahigh frequency
ULLS	unit-level logistics system
ULLS-G	unit-level logistics system-ground
UMCP	unit maintenance collection point
US	United States
USAES	United States Army Engineer School
USAF	United States Air Force
USMTF	United States message text format
UTM	universal transverse mercator
UTO	unit task organization
V4	version 4
V	Volcano
VAP	visible area plot
veh	vehicle
vert	vertical
VGA	video graphics array
VHSIC	very high-speed integrated circuit
VIC III	vehicular intercom system III
VIICS	vehicular intra/inter communications system
VMF	variable message format
VTC	video teleconferencing
VNR	VIICS net radio
W	wide area munitions clusters
WAM	wide area munitions
WAN	wide area network

WFA	Warfighter Associate
WIA	wounded in action
WIN	warfighter information network
WO	warning order
XO	executive officer

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